NAVAL POSTGRADUATE SCHOOL
Monterey, California

THESIS

AN ANALYSIS OF THE IMPACT OF RELIABILITY AND MAINTAINABILITY ON THE OPERATING AND SUPPORT (O&S) COSTS AND OPERATIONAL AVAILABILITY (AO) OF THE RAH-66 COMANCHE HELICOPTER

by

Gregg M. Dellert

December 2001

Thesis Advisor:	Thom Crouch
Associate Advisor:	Keebom Kang

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The RAH-66 Comanche helicopter program was initiated in 1983 to develop a reliable and maintainable attack/reconnaissance aircraft to replace the aging fleet of AH-1 Cobra and OH-58 A/C helicopters. After several funding reductions and restructurings, the program entered the Engineering and Manufacturing Development (EMD) stage of the acquisition process in 2000. With only four years remaining until initial fielding, the program office is still attempting to reach the ambitious reliability and maintainability goals needed to experience reduced operating and support (O&S) costs and high operational availability (Ao).

This thesis analyzes the impact of reliability and maintainability on the O&S costs and Ao of the Comanche helicopter. The research focused on the question of where the Comanche program office should allocate resources to minimize O&S costs and maximize Ao. The research indicated that the best allocation of resources is to the improvement of system reliability. The negative impact to both O&S costs and Ao is significant if the predicted reliability goals are not met.

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AN ANALYSIS OF THE IMPACT OF RELIABILITY AND MAINTAINABILITY ON THE OPERATING AND SUPPORT (O&S) COSTS AND OPERATIONAL AVAILABILITY (AO) OF THE RAH-66 COMANCHE HELICOPTER

Gregg M. Dellert
Captain, United States Army
B.S., United States Military Academy, 1993

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December 2001

Author: Gregg M. Dellert
Gregg M. Dellert

Approved by:
Thom Crouch, Thesis Advisor

Keebom Kang, Associate Advisor

Kenneth J. Euske, Dean
Graduate School of Business and Public Policy

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ABSTRACT

The RAH-66 Comanche helicopter program was initiated in 1983 to develop a reliable and maintainable attack/reconnaissance aircraft to replace the aging fleet of AH-1 Cobra and OH-58 A/C helicopters. After several funding reductions and restructurings, the program entered the Engineering and Manufacturing Development (EMD) stage of the acquisition process in 2000. With only four years remaining until initial fielding, the program office is still attempting to reach the ambitious reliability and maintainability goals needed to experience reduced operating and support (O&S) costs and high operational availability (Ao).

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LIST OF ACRONYMS

Ao……..... Operational Availability
BIT……..... Built In Test
BITE…….....Built In Test Equipment
CLS……..... Contractor Logistics Support
DoD……..... Department of Defense
DMMHFH…….....Direct Maintenance Man Hours per Flight Hour
EMA……..... Essential Maintenance Action
EMD…….....Engineering and Manufacturing Development
FY……..... Fiscal Year
GAO……..... ……General Accounting Office
ILS…….....Integrated Logistics Support
IPT…….....Integrated Product Team
LRIP…….....Low Rate Initial Production
M…….....Maintainability
MaxTTR…….....Max Time to Repair (UMA's)
MTBEMA…..... ……Mean Time Between Essential Maintenance Actions
MTBF…..... ……Mean Time Between Failure
MTBUMA…..... ……Mean Time Between Unscheduled Maintenance Actions
MTTR… ..... ……Mean Time To Repair (UMA's)
MTTRe…..... ……Mean Time To Repair (EMA's)
MTTRe-REM…..... ……Mean Time To Repair (EMA Removals)
MTTRe-REP…..... ……Mean Time To Repair (EMA Repairs)
MTTR-REM… ..... ……Mean Time To Repair (UMA Removals)
MTTR-REP…..... ……Mean Time To Repair (UMA Repairs)
O&M…..... ……Operation & Maintenance
O&S… ..... ……Operating & Support
OMB ..... Office of Management & Budget
ORD…..... ……Operational Requirements Document
PEO……..... ……Program Executive Officer
POL……..... ……Petroleum, Oil & Lubricants
PM… ..... ……Program Manager
PMO…..... ……Program Management Office
R… ……..... ……Reliability
R&M……..... ……Reliability & Maintainability
RDT&E……..... ……Research, Development, Test & Evaluation
SMA……..... ……Scheduled Maintenance Action
TSM……..... ……TRADOC Systems Manager
UMA……..... ……Unscheduled Maintenance Action
USD (AT&L) …… Under Secretary of Defense (Acquisition, Technology & Logistics)

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I. INTRODUCTION

A. PURPOSE

The purpose of this thesis is to provide a cost and availability based decision support tool that will allow the Comanche helicopter program manager to obtain the greatest return on investment in terms of lower operating and support (O&S) costs and higher operational availability (Ao). This will be accomplished through the integration of all factors impacting both O&S costs and Ao in a software model that will establish the appropriate relationships among the factors.

This thesis will then analyze those relationships to determine the impact that differing levels of reliability and maintainability will have on both O&S costs and Ao for the Comanche. This information can be useful for the program manager in making trade-offs when program resources are limited. This work will also provide other program managers with an easily adaptable model for analyzing the impact of different factors in their programs.

B. BACKGROUND

The RAH-66 Comanche program was established in 1983 to replace the Army's light helicopter fleet. The contractor team of Boeing Helicopter Company and Sikorsky Aircraft Corporation were expected to design a low cost, lightweight and technologically advanced helicopter capable of performing both the armed reconnaissance and attack missions.

The Comanche helicopter is the first Army helicopter ever to be designed for a two level maintenance and repair process, organizational and depot maintenance. In order for this process to be feasible the Comanche must meet ambitious reliability, maintainability and BIT capability goals. These goals are significantly higher than those obtained by the current Army helicopter fleet. The Comanche program has received significant criticism in several General Accounting Office (GAO) Reports concerning the progress toward meeting these ambitious goals.[Ref. 34-36]

At the outset of the program 19 years ago the Comanche was being promoted as a highly reliable and maintainable helicopter that could be operated and maintained for a lower cost than its predecessors. Over the past decade though, the Comanche program has experienced numerous program restructures due to very unstable funding and changing of service acquisition priorities. These problems, in combination with other factors, have prohibited the Comanche from reaching its goals for reliability (R) and maintainability (M) as of this date. As in every other major defense acquisition program, the Comanche program manager (PM) is primarily evaluated on two factors, cost and schedule. Although R&M has received significant emphasis in the Comanche program, it is highly likely that any further program budget cuts will have a direct negative impact on the efforts in this area. It is critical that the PM make informed trade-offs in this situation to minimize the impact on the long-term performance of the Comanche helicopter.

C. RESEARCH QUESTIONS

The primary research question of this thesis is: How can the RAH-66 Comanche Program Office best allocate resources to obtain the lowest operation and support costs and greatest operational availability in a resource-constrained environment? The subsidiary research questions are as follows:

1. What actions is the Comanche program office currently taking to improve system reliability and maintainability?
2. What is the impact of not meeting required reliability and maintainability goals in regards to O&S costs and Ao?
3. How is BIT technology being utilized in the RAH-66 Comanche to improve reliability and maintainability?
4. What are the program goals for reliability, maintainability?
5. How are reliability and maintainability measured?
6. What are the critical systems where improvement will produce the greatest impact on O&S costs or Ao?

7. If the planned service life is extended beyond 20 years, when is it best to conduct recapitalization of the aircraft?

8. What is the impact on O&S costs and Ao if the flying hour rate is higher than planned.

D. SCOPE

The focus of this thesis is on constructing a model to estimate the O&S costs and Ao of the Comanche and then utilizing the model to analyze the impact of changing reliability and maintainability. Although the model is built specifically for the Comanche helicopter, it is easily adaptable to other weapon systems to provide the same analytical capability.

The scope is limited to the reliability of the major components and systems of the Comanche helicopter and the model will not incorporate the tactics or doctrine used by the aviation commander in employing the RAH-66 Comanche. The model is also limited by the accuracy of the information that was entered into the model. Because the Comanche is not fully developed or fielded yet, much of the data is either projections or forecasts that are changing constantly as the program progresses. Also, some of the data are not yet available because testing has not been completed. These scope limitations should not detract from general findings and conclusions of the thesis research.

E. METHODOLOGY

In completing this thesis the author used the five-step process described below.

1. Conduct a literature review of program documents and General Accounting Office Reports to determine critical elements of the Comanche program affecting O&S costs and Ao.

2. Conduct telephone and email interviews with members of the Comanche program and contractors office and to gather current and relevant data necessary for realistic modeling of the Comanche.

3. Build a model using Microsoft Excel and Crystal Ball simulation software that incorporates all factors affecting O&S costs and Ao of the Comanche helicopter.

4. Run multiple simulations of the model, varying the reliability and maintainability values within realistic ranges.

5. Interpret and analyze the results of the simulations to draw conclusions and make recommendations as to the best allocation of resources.

F. THESIS ORGANIZATION

Chapter I. Introduction: Identifies the focus and purpose of this thesis as well as the primary and subsidiary research questions.

Chapter II: Background: Provides the reader with a basic understanding of the elements that are included in the Comanche maintenance and repair process model. This chapter also provides a brief description of the RAH-66 Comanche program.

Chapter III: Model & Data: Presents the methodology and logic behind the cost and availability model

Chapter IV: Results and Analysis: Discusses the running of simulations and analyzes the results of the simulations to determine impacts on O&S costs and operational availability.

Chapter V: Conclusions and Recommendations: Summarizes the findings of the research and answers the research questions.

II. BACKGROUND

A. CHAPTER OVERVIEW

The purpose of this chapter is twofold; first, the historical trends in the DoD budget process and O&S costs will be covered to provide insight into the importance of cost reduction. Second, the reader will be provided with a generic cost estimation framework that will make it easier to understand the methodology behind the Comanche cost and availability model and the follow on reliability and maintainability analysis.

A description of operational availability and its components is also covered to aid in understanding of availability analysis conducted further in this thesis.

B. DEPARTMENT OF DEFENSE BUDGET

In an environment of declining defense budgets, obtaining the appropriate balance between procurement of new weapon systems and sustaining the current systems will be extremely challenging and require careful analysis to effect cost reductions. Table 1 shows the Department of Defense budget trends from 1990-2001.[Ref. 3:appendix B] Over those eleven years, the DoD budget has decreased each year in constant dollars until 1997. Even with the increase experienced in 1998, the funding in 2001 is still only equal to that of 1995. Not shown, but also true, the DoD budget as a percentage of the overall federal budget has decreased in this same time period.

Fiscal Year	Current $ (Billions)	Constant FY 01 $ (Billions)	Real Growth Percentage
1990	293.0	382.5	-2.1
1991	276.2	343.4	-10.2
1992	281.9	342.9	-0.1
1993	267.4	318.3	-7.2
1994	251.4	292.7	-8
1995	255.7	291.3	-0.5
1996	254.4	284.5	-2.6
1997	257.9	282.4	-0.7
1998	258.5	277.2	-1.9
1999	278.4	292.6	5.5
2000	279.9	287.8	-1.6
2001	291.1	291.1	1.1

Table 1 Department of Defense Budget Authority

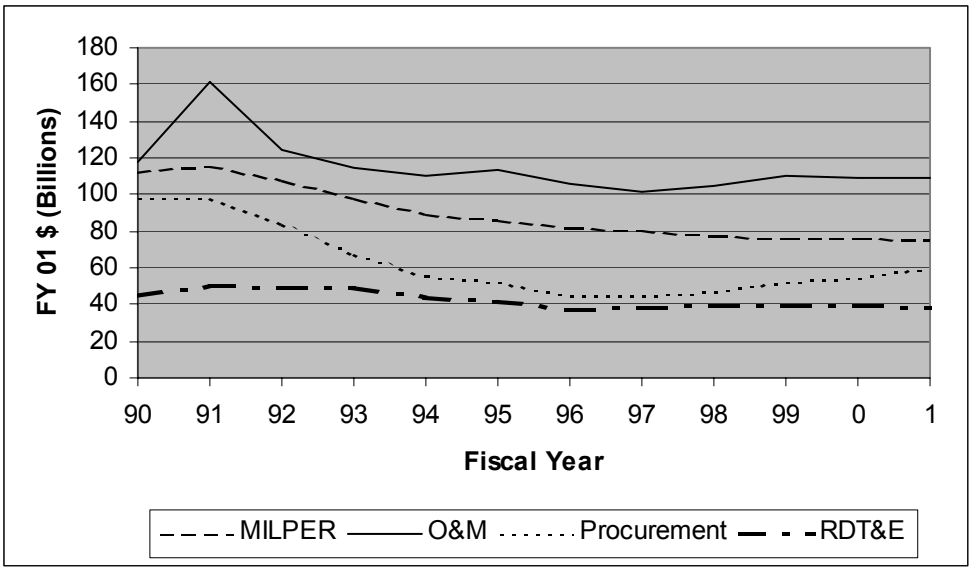

Figure 1 DoD Budget Authority by Appropriation

These budget reductions reflect heavily in the funding for operation and maintenance (O&M) and procurement as shown in Figure 1.[Ref. 3:appendix B] The O&M increase in FY 91 is a result of the additional funding for Operation Desert Shield and Desert Storm.

Unlike mandatory funding, the annual O&M appropriation is considered discretionary funding, which means there is no minimum amount that Congress is required to authorize each year. This often leads to O&M being targeted first when funding reductions are needed. The primary purpose of O&M funding is to pay for all repair parts, fuel and service parts for the various weapon systems in the military inventory. The O&M budget is also reduced due to the increased Operational Tempo (OPTEMPO) of the military. Contingency operations such as Bosnia or Afghanistan, are financed from the O&M appropriation, leaving even less money to cover the primary purpose of the funding. This is a significant issue considering the increased involvement of the US military in contingency and peacekeeping operations throughout the world in the last decade. These budgetary reductions in O&M and procurement have forced the military to find ways to maintain readiness with less funding. This is a primary reason that there is a renewed focus on developing weapon systems that are less costly to operate and maintain than the current systems in the inventory.

As equipment ages the cost to maintain the equipment grows and demands a higher share of the appropriated O&M funding. Although O&M dollars are classified differently than procurement dollars, the overall pool of money available is limited. This requires a delicate balance between supporting legacy systems and procuring new weapon systems. Figure 2 depicts the impact of funding if this balance is hampered by increases in funding required to support the legacy systems.[Ref. 29:slide 11] The Army is currently facing the predicament of increasing O&S costs for legacy aircraft. The cost to support the legacy systems is increasing each year, which is reducing the procurement funds available for new aircraft. Therefore, it is significantly important that the Comanche program management office (PMO) use their resources wisely to develop and produce an aircraft with operating and support costs below those of the aircraft the Comanche is designated to replace.

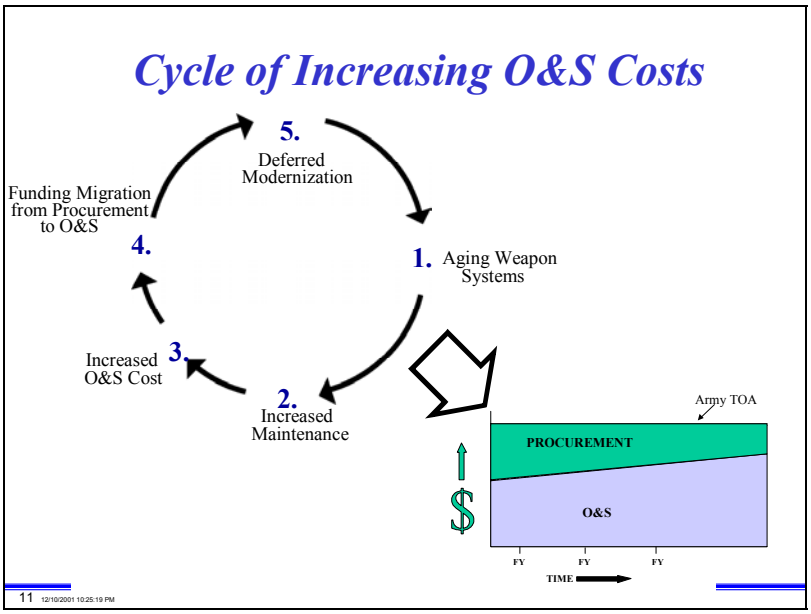

Figure 2 Cycle of Increasing O&S Costs "From Ref [29]"

C. OPERATION AND SUPPORT COSTS BACKGROUND

The decision to design, develop, procure and support a new weapon system, such as a helicopter, is based on many factors, one of which is the estimated cost of the system over the useful lifetime. The life-cycle cost begins with the determination of a mission requirement and continues through design, development, production, operation and

support of a weapon system and eventually to the disposal and demilitarization of the system at the end of its useful life. O&S costs have historically represented sixty percent of the total life-cycle costs of a system. The foundation for which O&S costs are derived are the design-to-cost efforts and trade-offs that occur early on in a program timeline. For purposes of cost estimation, life-cycle cost is typically separated into four areas: research and development, investment, operating and support, and disposal. Although the percentage of life-cycle costs attributable to each element is not exactly the same for all weapon systems; it varies little across the range of different systems. The historical life-cycle cost percentage breakdown for major defense weapons systems is depicted in Figure 3.[Ref. 21:chp. 2]

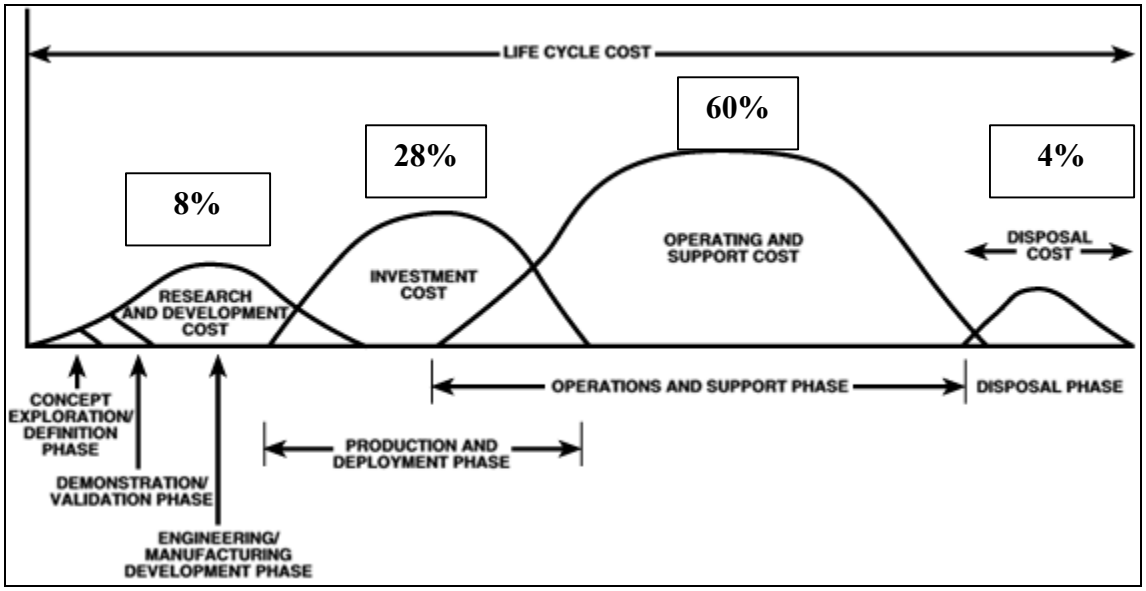

Figure 3 Weapon System Life-Cycle Cost Breakdown "After Ref. [21]"

In 1997, the Assistant Secretary of the Army for Research Development and Acquisition, Gilbert Decker, was quoted with the following statement indicating the shift towards total ownership cost reduction.[Ref. 16:p. 1]

> DOD Directive 500.1 requires that a total system approach be used in acquisition programs to optimize total system performance and minimize the cost of ownership. We have made impressive gains in reducing acquisition costs through the use of efficient business practices, modern technologies and process innovation. Now we must also focus our energies on reducing sustainment costs for our deployed systems.

In the past five years there has been increasing emphasis at OSD and Army levels on reduction of O&S costs.[Ref. 23] Before this time period program managers were traditionally concerned with only three criteria for their program; cost, schedule and performance. Increased emphasis on total cost reduction has added a fourth-criteria to this list, supportability. According to Army executives, supportability is co-equal now with cost, schedule and performance in material development.[Ref. 12] This new philosophy of O&S cost reduction was further embodied in the implementation of the Total Ownership Cost Reduction Program, for which the Comanche program was selected as a pilot program. This program, along with guidance from the former Undersecretary of Defense for Acquisition and Technology, Dr. Gansler, increases the responsibility of the program manager (PM) for the O&S costs of their respective systems.[Ref. 10] In the past, PMs were not held responsible for the level of O&S costs because after fielding, the Army Material Command (AMC) was responsible for funding all costs related to O&S. Although, AMC is still responsible for the funding, OSD is forcing PMs to increase their consideration of O&S costs in the decision making process during the early stages of the program.

D. OPERATING AND SUPPORT COST ESTIMATION

Cost estimating is a means to translate resource requirements associated with programs into estimated dollars. The format for Operating and Support cost estimation applied in this thesis comes from the Operating and Support Cost Estimating Guide. The Office of the Secretary of Defense (OSD) Cost Analysis Improvement Group (CAIG) is the responsible agency for publishing the O&S Cost Estimating Guide. DoD instruction 5000.2, DoD Directive 5000.1 and DoD 5000.2-M identify the CAIG as the principal advisory body to acquisition decision authorities on cost related issues. The cost

estimating guide is used by all DoD components, and should be considered the authoritative source document for preparing O&S cost estimates.[Ref. 6]

The O&S Cost Estimating Guide identifies seven major cost elements applicable for a generic aircraft system as presented in Figure 3.[Ref. 21:chp. 4]

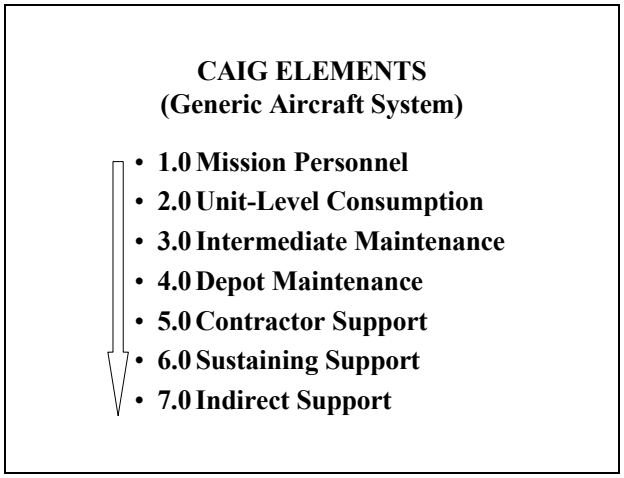

Figure 4 CAIG Generic Aircraft Cost Element Structure

A generic description of the makeup of costs for each element is given below. In the actual development of the Comanche cost estimation model these elements were tailored to the specific weapon system to allow for more efficient analysis in meeting the objectives of this thesis. Therefore, the costs associated with each element in the general description may be included as part of a different cost element in the actual cost model.

1. Mission Personnel

The mission personnel cost element includes the cost of pay and allowances of officers, non-commissioned officers, enlisted and civilian personnel required to operate, maintain and support a weapon system in a deployable unit. This includes personnel necessary to meet combat readiness, unit training, and administration requirements.[Ref. 21:appendix C]

The operations personnel encompass those individuals required to operate a system. This includes the officers and enlisted personnel that are physically aboard the aircraft during flight.

The maintenance personnel are those individuals who perform maintenance on the assigned aircraft, associated support equipment and unit-level training devices. Depending on the maintenance concept and organizational structure, this element will include maintenance personnel at the organizational level and possibly the intermediate level if appropriate.

Support personnel are the individuals that perform unit staff functions and other unit or mission related support activities. This includes the unit staff members and personnel required for unit administration, fuel and munitions handling, ground safety, logistics and ground equipment maintenance.

The pay and allowances for personnel is based on the standard composite rate, which includes the following elements: basic pay, retired pay accrual, incentive pay, variable housing allowance, hazardous duty pay, uniform/clothing allowances, overseas station allowances and social security contributions. For units that operate more than one type of aircraft, personnel requirements are allocated on a relative workload basis. The personnel costs are based on actual or projected manning levels and skill categories required for the specific unit.[Ref. 21: appendix C]

2. Unit-Level Consumption

Unit level consumption cost captures the direct costs associated with the operation and support of an individual aircraft and supporting equipment at the unit level. The major sub-elements of unit-level consumption are:

- petroleum, oil and lubricants (POL)
- consumable material
- depot-level repair (DLR) parts
- training munitions/expendable stores
- transportation

The cost for petroleum, oil and lubricants (POL) is the cost of all POL products required to operate the aircraft and supporting equipment during peacetime flight operations.

The cost for consumable material covers all consumable material required to support an aircraft and associated support equipment at the unit level. Consumable materials are those items purchased for one-time use on an aircraft, such as filters and gaskets, and then discarded when they must be replaced. The consumables cost included in this element are those incurred during the performance of Organizational level maintenance. Organizational maintenance is defined in DODD 4151.18 as the following:

> Maintenance normally performed by an operating unit on a day-to-day basis in support of its own operations. The organizational-level maintenance mission is to maintain assigned equipment in a full mission-capable status while continually improving the process. Organizational-level maintenance can be grouped under categories of "inspections," "servicing," "handling," and "preventive maintenance."[Ref. 7]

In some situations the maintenance concept or organizational structure may include the intermediate level maintenance facility as part of the unit level organization. In this case, the intermediate level consumables cost may be included as part of this cost element.

The cost for DLR parts covers all parts that are used to replace initial stocks. DLRs are spare parts, assemblies or sub-assemblies that, when removed from an aircraft, are returned to a central maintenance facility for repair and reuse.

The cost of training munitions and expendable stores covers the cost of live and inert ammunition, rockets, training missiles and pyrotechnics expended in non-combat operations and training exercises.

Transportation costs are those costs associated with the shipping of repair parts to the unit from the depot facility or appropriate parts supplier.

3. Intermediate Maintenance (External to Unit)

In many cases the intermediate level maintenance facility is responsible for providing support to several units on an installation or geographical area. In this situation the costs for intermediate maintenance are separated from the unit-level consumption

costs and regarded as a separate cost element. The DoD definition of Intermediate-level maintenance is:

> That materiel maintenance that is the responsibility of, and performed by, designated maintenance activities in support of using organizations. The intermediate-level maintenance mission is to enhance and sustain the combat readiness and mission capability of supported activities by providing quality and timely materiel support at the nearest location with the 1owest practical resource expenditure. Intermediate-level maintenance includes limited repair of commodity-orientated components and end items, job shop, bay, and production line operations for special mission requirements; repair of printed circuit boards, software maintenance, and fabrication or manufacture of repair parts, assemblies and components.[Ref. 7]

The cost for intermediate maintenance performed external to a unit is comprised of three sub-elements:

- maintenance labor
- consumable material
- other costs

The cost for maintenance labor covers the pay and allowances of military and civilian personnel who perform intermediate maintenance on an aircraft system, associated support equipment, and unit-level training devices.[Ref. 21:appendix C]

The cost of consumable material is similar to that included in estimating unit-level consumption. In this case the cost is for the repair parts, and material consumed by the intermediate level maintenance facility in the maintenance and repair of aircraft and associated support equipment for the supported organizational unit.

Other costs that may be included in this element are transportation costs associated with the shipment of parts and assemblies to a base or depot facility.

4. Depot Maintenance

Depot maintenance, as defined by DoD is:

> That materiel maintenance requiring major overhaul or a complete rebuilding of parts, assemblies, subassemblies, and end items, including the manufacture of parts, modifications, testing, and reclamation as required. Depot maintenance serves to support lower categories of maintenance by providing technical assistance and performing that maintenance beyond their responsibility. Depot maintenance provides stocks of serviceable equipment because it has available more extensive facilities for repair than are available in lower maintenance activities. Depot maintenance includes all aspects of software maintenance. [Ref. 7]

Depot maintenance includes the costs for labor, material and overhead incurred in performing major overhauls or maintenance on aircraft, their components, and associated support equipment at centralized repair depots, contractor repair facilities or on site by depot maintenance teams. The primary sub-element of depot maintenance costs is overhaul/rework. This includes all labor, consumable material and overhead costs for overhaul or rework of aircraft returned to a centralized depot facility. Other costs associated with depot maintenance can include component repair costs for repair parts not managed by the Defense Business operations fund (DBOF), transportation costs for aircraft requiring major overhaul and any contracted unit-level support. The costs for DLR parts acquired through DBOF are included in the costs for element two, unit-level consumption.[Ref. 7: appendix C]

5. Contractor Support

Contractor support includes the cost of contractor labor, materials, and overhead incurred providing the required logistics support for an aircraft system, subsystem or associated support equipment. Contract maintenance is performed by commercial organizations using contractor personnel and either contractor equipment and facilities or government furnished equipment and facilities. Contractor support may be incorporated into every level of maintenance and is normally interim contractor support or contract logistics support.

Interim contractor support (ICS) is the providing of partial or total temporary logistics support until Government maintenance capability is developed. The costs associated with ICS are those associated with contract labor, material and assets necessary to provide the required logistics support for the weapon system and associated support equipment. After the initial ICS period some contractor support may still be employed for specific areas such as sustaining engineering, software maintenance, simulator operations and selected depot maintenance.[Ref. 21:appendix C]

Contractor logistics support (CLS) is the providing of contractor support over the total useful life of a weapon system and can either be incorporated with or take the place of Government maintenance capability. The costs associated with CLS are the same as ICS, with the addition of depot level maintenance.

6. Sustaining Support

Sustaining support primarily includes the cost of sustaining engineering and software maintenance support provided for an aircraft system.

Sustaining engineering support covers the labor, material and overhead costs incurred in providing continued systems engineering and program management oversight to maintain operational reliability, approve design changes and ensure system conformance with established specifications and standards. Other included costs for engineering support are those associated with contractor provided services such as; technical advice, training for component system installation, operation, maintenance and support of the weapon system.[Ref. 21:appendix C]

Software maintenance support covers the labor, material and overhead costs incurred after system fielding for the update, maintenance, modification, integration and configuration management of software. This service can be provided by either government facilities or contracted out to a civilian organization.

7. Indirect Support

Indirect support covers two primary areas; cost of personnel support for specialty training and costs for special base operating support.

The personnel support includes all costs for system-specific and related specialty training for military personnel replacing individuals lost through attrition. Specialty training costs may include those for pilot training, non-pilot aircrew training and enlisted maintenance specialty training. Training costs include the cost for course materials as well as the pay for course instructors, trainees and training support personnel.

Special base operating support consists of personnel normally assigned to a host installation who are required for the unit to perform its mission during peacetime. Only personnel directly supporting the unit are included in estimating the base operating support costs. Also included in base operating support is the cot for personnel, material and utilities needed for the maintenance and operation of system-specific mission-related real property on the installation.[Ref. 21:appendix C]

E. O &S COST DATABASES

In an effort to provide valuable information for the estimation of O&S costs, the Army maintains databases containing historical cost information on many of the major weapon systems in the inventory. Two of the most useful databases are The Operating and Support Management Information System (OSMIS) and The Force and Organization Cost Estimating System (FORCES).

OSMIS is the Army's portion of the DoD Visibility and Management of Operating and Support Costs (VAMOSC) Program. The Army Cost and Economic Analysis Center (CEAC) is responsible for managing this system and updating the information on over 500 systems deployed in tactical units – Active, Guard and Reserve. OSMIS contains information on Class III POL usage, Class V training ammunition usage, and Class IX consumption for ground vehicles, aircraft and electronic equipment.

When retrieving information from this database it is possible to query information according to system type, Major Command, Installation and UIC.[Ref. 1]

FORCES is a suite of models and database that provides realistic, current and supportable force cost estimates of Active, Guard and Reserve Component Table of Organization and Equipment units. With FORCES, it is possible for a user to determine force cost estimates for contingency operations and also cost savings possible through reductions in military end strength.[Ref. 8]

F. OPERATIONAL AVAILABILITY (A_O)

Operational Availability is a key performance parameter for any weapon system. The definition of Ao with respect to the Comanche helicopter is stated below:

> Operational availability is a measure of the degree to which an aircraft is operating or capable of operating at any random point in time. Ao does not imply a mission success rate, rather only the ability to launch a mission.[Ref. 26:p. 54]

The following equation shows how Ao is calculated for the Comanche helicopter.[Ref. 26:p. 50]

$$Ao = 1 - OT/TT \times ((MTTRe + ALDT)/MTBEMA)$$

where:

OT	= Operational Flight Hours in a Given Time Period
TT	= Total Clock Hours in a Given Time Period
MTTRe	= Mean Time to Repair for EMA
MTBEMA	= Mean Time Between EMA
ALDT	= Administrative and Logistics Downtime

Maintenance Down Time (MDT) is equal to the sum of MTTRe and ALDT. This is the total elapsed time required to restore a system to full operating condition taking into account the hands on repair time and the delay time associated with obtaining the necessary parts, materials and equipment.

G. RELIABILITY AND MAINTAINABILITY

Up to this point, this chapter has covered the framework for cost estimating and computation of operational availability. It is necessary to establish the proper framework for the cost and availability model in order to accomplish the primary objective of analyzing the impact of reliability and maintainability on the O&S costs and Ao of the Comanche helicopter. Reliability and maintainability are often noted as the biggest influences of the O&S costs and Ao of a system.

Reliability is commonly defined as:

> The probability that a system will operate within the designed specified limits for a particular period of time when used in the manner intended.[Ref. 8:p. 25]

The most common measure of reliability is Mean Time Between Failures (MTBF), the average operational time elapsed between required maintenance actions on a component or a system as a whole. For the Comanche, the two measures of reliability utilized by the PMO are variations of MTBF in that they are measuring different types of faults. The two reliability measures for the Comanche are, Mean Time Between Unscheduled Maintenance Actions (MTBUMA) and Mean Time Between Essential Maintenance Actions (MTBEMA). It is important to note the difference between unscheduled maintenance actions (UMA) and essential maintenance actions (EMA) because they each result in different operational capabilities for the aircraft. Unscheduled maintenance actions are defined as:

> All unscheduled aircraft failure conditions that require corrective action and are not identified as scheduled maintenance. Any impending or actual failure requiring corrective action found during a scheduled inspection shall be an UMA. Replacement of any item prior to its reaching a prescribed durability requirement is an UMA except scheduled replacements as the result of prognostic indications.[Ref. 26:p. 53]

Essential maintenance actions are defined below:

> Any failure generating an unscheduled maintenance action that cannot be deferred and causes the loss of one or more mission essential functions, regardless of when it is discovered. This includes any unscheduled maintenance actions that require corrective maintenance prior to the next mission and the restoring of redundant/fault tolerant systems to operational status.[Ref. 26:p. 53]

As the definitions indicate, UMAs cover all corrective maintenance conditions including EMAs. But, EMAs are the critical failures that cause an aircraft to lose mission functionality. An example of an UMA is the malfunction of the clock in the aircraft. This will require some sort of corrective maintenance, but it is not critical to the operational effectiveness of the aircraft. An example of an EMA is the malfunction of the aircraft radar. Without a functioning radar system, the aircraft loses one of its primary operational capabilities.

The reliability of a system will rarely ever remain at a constant level throughout its entire useable life. Instead, the reliability normally follows a curve commonly referred to as the "bathtub curve" depicted in Figure 5.[Ref. 19:p. 21]

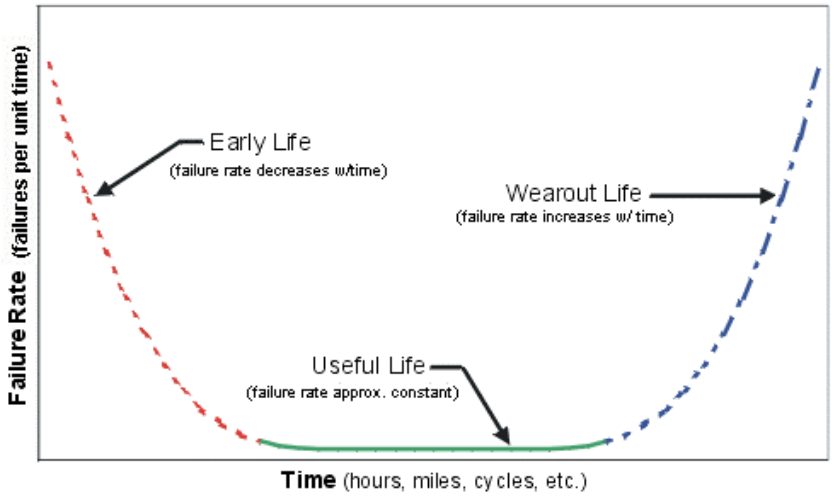

Figure 5 Reliability Bathtub Curve "From Ref. [19]"

There are three separate stages in the bathtub curve; burn-in, normal operating and wear out. The first stage; burn-in, is characterized by a rapid improvement in reliability as manufacturing and design defects are weeded out.[Ref. 19:p. 21] The second stage is characterized by a leveling off in reliability where the failure rate remains constant. This stage is invariably the longest stage of the three.[Ref. 19:p. 21] The third stage is the wear out stage. During this time period the failure rate rises sharply due to aging and deterioration of parts.[Ref. 19:p. 21]

The other factor under consideration is maintainability, which is defined below:

> The probability that a device that has failed will be restored to operational effectiveness within a given period of time when the maintenance action is performed in accordance with prescribed procedures.[Ref. 8:p. 25]

The primary measure of maintainability is Mean Time to Repair, of which the Comanche PMO uses two variants: Mean Time to Repair UMA (MTTRu) and Mean Time to Repair EMA (MTTRe). These two measures are defined below.

> MTTRu – the average total time in maintenance man-hours it takes to complete unscheduled maintenance actions and return a system to fully mission capable status.[Ref. 26:p. 53]

> MTTRe – The average total time in maintenance man-hours to complete corrective maintenance actions on essential aircraft failures.[Ref. 26:p. 53]

H. RAH-66 COMANCHE PROGRAM DESCRIPTION

The RAH-66 Comanche program office was established in 1984 after the preliminary design studies on the Light Helicopter Family (LHX) proved value in the development of a new helicopter. The PMO's original acquisition estimated production of the helicopter to begin in FY90. Several reductions in funding have forced the restructuring of the program, causing a considerable lengthening of the schedule and a reduction in the quantity of helicopters being procured. Currently the RAH-66 program

is in the Engineering and Manufacturing Development (EMD) phase with an expected Initial Operational Capability (IOC) date of FY06.[Ref. 10]

In design and development of the Comanche, the PMO and contractors have regarded the inclusion of reliability and maintainability as extremely important. This has been evident in both the actual design of the aircraft and also the initiatives that the PMO has implemented. From the beginning of the program, military maintenance personnel and pilots have been included to ensure the layout and components were designed to provide a high level of maintainability. The design of the aircraft also includes embedded diagnostic to help the crew and maintainers correctly detect and isolate system faults.[Ref. 2:p. 48] In addition to the embedded diagnostics, there will be a portable maintenance aid that provides the maintainers even a greater diagnostic and record keeping capability.[Ref. 27]

A major initiative the program implemented is the Failure Reporting Analysis and Corrective Action System (FRACAS). This program is set up to identify, track and fix all reliability, maintainability and diagnostics failures on the aircraft.[Ref. 22:p. 5] This process promotes the early discovery of failure modes that can be immediately addressed with design changes and process improvements.[Ref. 22:p. 5]

The Comanche helicopter shown in Figure 6 is the Army's newest light attack/reconnaissance helicopter. It is a lightweight; twin engine advanced technology helicopter that will replace the current light fleet of tactically obsolete OH-58 and AH-1 helicopters. The Comanche is designed to require fewer personnel and less support equipment than any other helicopter in the Army inventory. The Comanche has been designed from the beginning for ease of maintenance with the incorporation of numerous access panels, easily accessible line-replaceable units and advanced built-in-test and diagnostic capability in the aircraft design.[Ref. 22:p. 1]

Figure 6 RAH-66 Comanche Helicopter "From Ref. [33]"

I. CHAPTER SUMMARY

This chapter has discussed all of the basic elements necessary for the reader to understand the importance of O&S cost estimating and the methodology behind the Comanche cost and availability model. In the next chapter the specific format of the Comanche model is covered as well as the data and methodology utilized in constructing the model.

II. COMANCHE MODEL AND DATA

A. CHAPTER OVERVIEW

In the previous chapter the reader was presented with the general framework for estimating O&S costs and Ao. This chapter describes the application of that information in the development of the cost and operational availability model for the Comanche helicopter. Included in this chapter is an overview of the model and a detailed description of the methodology and logic used in the development of the model.

Although this model was developed to estimate the O&S costs and Ao of the Comanche helicopter, the focus was on the methodology behind the estimation and not the actual input data. Since the Comanche is still under development, much of the data is either predicted based on program projections or assimilated from historical data in the OSMIS database.

B. COMANCHE MODEL DESCRIPTION

In developing the Comanche cost and availability model it was important to establish a framework that allowed for the efficient collection, organization, calculation and analysis of costs and availability. To accomplish this the seven general cost elements provided in the CAIG framework were modified and combined into six cost elements. Intermediate-level maintenance was not included as a cost element in the model based on the fact that the Comanche is being designed for two levels of maintenance; organizational and depot level. The six cost elements utilized for the estimation of Comanche O&S costs are depicted in Figure 7.

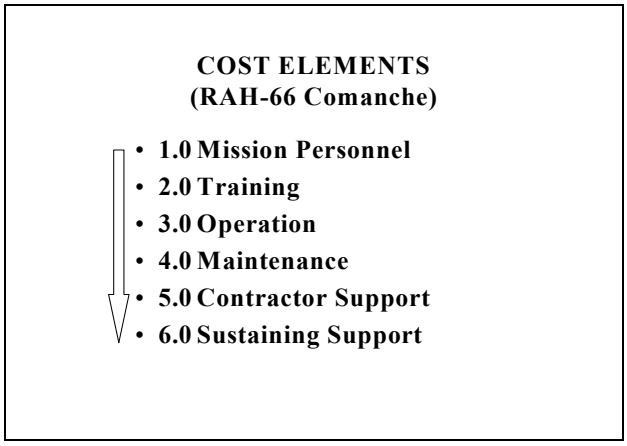

Figure 7 Comanche Model Cost Elements

Before explaining the major cost elements it is important to understand how the model was developed using Microsoft Excel software. The model consists of ten different worksheets that fall into two functional categories, Reference Worksheets (RW) and Decision Support Worksheets (DSW). The five RWs utilized in the Comanche model are depicted in Figure 8.

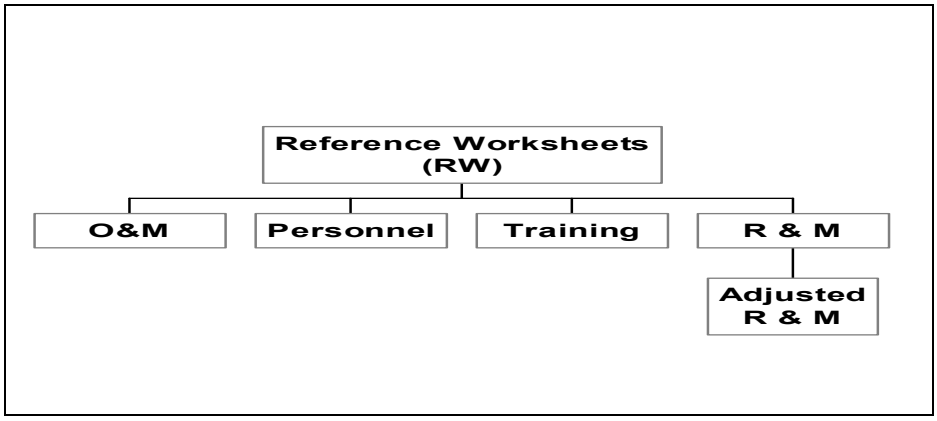

Figure 8 Reference Worksheet Breakdown

The raw data used in the model is entered into the five RWs that are broken down primarily by major cost element. For ease of use, many factors associated with operation, maintenance, contractor logistics support and system sustainment were combined on the

O&M RW. The adjusted R&M RW is a copy of the R&M RW except that it contains reliability and maintainability factors that can be varied for analysis purposes. If any R&M data changes are made, the adjusted R&M worksheet is automatically updated.

The second functional category, Decision Support Worksheets, encompasses the five worksheets depicted in Figure 9.

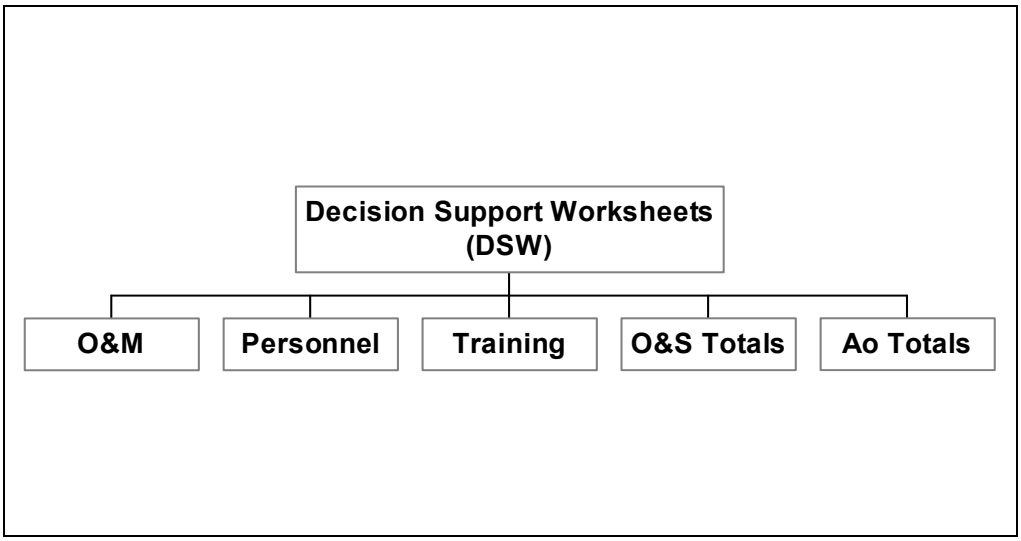

Figure 9 Decision Support Worksheet Breakdown

The DSWs use the data from the RWs and compute the O&S costs and Ao through the use of several different mathematical and financial equations. The direct link between the DSWs and RWs makes it possible for the user to change or update data in the RWs without having to modify the DSWs to incorporate the change. In developing the equations and formulas used in the DSWs the author attempted to model the real world operation and maintenance to first estimate the O&S costs and Ao, and then analyze the impact that variability in the reliability and maintainability will have. In an effort to make it easier for the reader to understand the equations and formulas used in the cost and availability computations, the author has assigned names to many of the cells relating to that cells contents. A listing of these names and brief definitions of their meaning can be found in Appendix A.

This model incorporates measurements of both reliability and maintainability in the computation of maintenance costs. Although the measurements for reliability and maintainability are entered into the RWs as discrete values, in reality these measurements represent random occurrences. In order to interject some aspects of randomness and uncertainty into the cost model, the author used Crystal Ball software. Crystal Ball allows for the modeling of reliability and maintainability based in accordance with a normal distribution. This provided for a more accurate estimate of O&S costs for the Comanche compared to a static model that does not take into account the variability of different factors.

The modeling of the Comanche helicopter was based on a useful life of 20 years as recommended by the CAIG. Table 2 lists the major categories of defense systems and their respective useful life according to the CAIG.[Ref. 21] Although, the useful life will most likely be greater than 20 years for the Comanche helicopter, the extension of the useful life would require the inclusion of cost factors that are indeterminable due to unknown reliability of components beyond their projected lifetime of twenty years.

SYSTEM TYPE	USEFUL LIFE (Years)
Fighter/Attack Aircraft	20
Cargo/Tanker Aircraft	25
Bomber Aircraft	25
Helicopter Aircraft	***20***
Small Missiles (Aircraft)	15
Large Missiles (ICBM)	20
Electronic Equipment	10
Ship (By Class)	20-40

Table 2 Recommended Useful Life for Cost Estimation "From Ref. [21]"

To convert constant dollars to current dollars for all cost elements, a normal discount rate of 3.2% was utilized. This discount rate is the recommended rate from the

Office of Management and Budget (OMB) Circular A-94 for discounting costs of systems with a useful life of twenty years or more.[Ref. 20]

Throughout this chapter the reader will find equations expressed in Microsoft Excel format. To aid in the understanding of the equations, the following table contains the common Excel symbols used and their purpose.

Symbol	Purpose
$	**Holds a referenced cell constant**
^	**Raises a value to an exponent**
*	**Multiplication Sign**
/	**Division Sign**

Table 3 Microsoft Excel Common Symbols

Beginning with the next section, the methodology behind the modeling of each major cost element in the Comanche model is described in detail. Appendix B contains printouts of all the worksheets comprising the Comanche model that the reader can reference whenever necessary.

C. OPERATION & SUPPORT COSTS

This section contains the explanation of the six cost elements making up the structure of the Comanche model. The methodology behind the estimation of each cost element is discussed along with the representative equations used to model the cost element in the Comanche cost and availability model. The estimation of costs was based on the most current fielding plan obtained from the PMO.[Ref. 24]

1. Mission Personnel

As discussed in the previous chapter, the mission personnel cost element is made up of the costs associated with the three functions personnel perform in a unit: operation,

maintenance and support. The only operation personnel for the Comanche are the pilots. These are both commissioned and warrant officers. The non-pilot air crewmen are not considered operational personnel in this case because they are not physically present on the aircraft during flight. The maintenance personnel for the Comanche include the maintainers (67C), repairers (68C), structural repairers (68G), the remaining non-aircraft specific maintenance personnel and also the maintenance test pilots (MTP). The support personnel are the remaining members of the unit that perform administrative, supply and ground maintenance and support functions. In situations where there is more than one type of aircraft in the unit; such as Heavy Attack units that will have both the Comanche and the AH-64D Apache, a percentage of the non-aircraft specific support personnel was used which correlates to the number of each type of aircraft in the unit.

The Comanche is being fielded to six different types of units; Light Attack, Heavy Attack, Divisional Cavalry, Regimental Aviation Squadron, Special Aviation Regiment and TDA. This correlates to varying quantities of personnel in terms of rank and function being assigned to each type of unit. Also, the actual quantity of personnel can differ in the same type of unit; based on the Major Command the unit is part of. The personnel input data used in estimating personnel costs for the Comanche was obtained from both the Comanche program office and from the FORCES database. Although the data was obtained from official sources, it is still only a prediction, the actual unit manning levels are partially dependent on the actual maintenance requirements of the aircraft, which are yet to be determined. Table 4 depicts the current manning requirements obtained from the PMO, broken down by rank for each type of unit that will be Comanche equipped.[Ref. 37]

	A	B	C	D	E	F	G
1	**Total Personnel**						
2	**Rank**	**Lt Attack**	**Hvy Attack**	**Div Cav**	**RAS**	**SOAR**	**TDA**
3	**Commissioned Officers**						
4	LTC (O-5)	1	1	1	1	1	1
5	MAJ (O-4)	2	2	2	2	1	1
6	CPT (O-3)	12	12	15	17	2	2
7	1LT (O-2)	9	10	13	14	0	0
8	Total (Per Unit)	24	25	31	34	4	4
9	**Warrant Officers**						
10	CW4	4	3	2	2	30	2
11	CW3	10	10	7	19	23	9
12	CW2	32	32	36	63	3	25
13	Total (Per Unit)	46	45	45	84	56	36
14	**Non Commissioned Officers**						
15	CSM/SGM (E-9)	1	1	1	1	1	1
16	1SG/MSG (E-8)	6	4	4	6	2	1
17	SFC (E-7)	12	11	13	8	9	0
18	SSG (E-6)	16	17	15	17	13	0
19	SGT (E-5)	23	36	39	33	36	0
20	Total (Per Unit)	58	69	72	65	61	2
21	**Enlisted**						
22	SPC (E-4)	55	53	46	69	18	0
23	PFC (E-3)	46	44	37	39	7	0
24	Total (Per Unit)	101	97	83	108	25	0
25	Unit Total	229	236	231	291	146	42

Table 4 Comanche Unit Manning Input Data

The salary data used in the computation of mission personnel costs are the official salaries for cost estimation listed in the FORCES database. These salaries include: basic pay, retired pay accrual, incentive pay, variable housing allowance, hazardous duty pay, uniform/clothing allowances, overseas station allowances and social security contributions. A .50% annual salary increase for all ranks is also incorporated in the personnel cost estimation. Although, the normal salary increase is higher than .50%, that increase is only on the base pay and the compensation used for this model incorporates several other pay elements that are not affected by the annual salary increase. Therefore, the .50% salary increase applied to the total compensation correlates to the normal 2-3% salary increase on only base pay. The annual compensation for each rank is provided in Table 5.[Ref. 9]

	Q	R
27	**Salary Data**	
28	**Commissioned Officers**	
29	LTC	$118,424
30	MAJ	$100,486
31	CPT	$79,342
32	1LT	$62,339
33	**Warrant Officers**	
34	CW4	$89,271
35	CW3	$79,758
36	CW2	$67,115
37	**Non Commisioned Officers**	
38	CSM/SGM	$77,207
39	1SG/MSG	$66,280
40	SFC	$56,865
41	SSG	$48,821
42	SGT	$40,729
43	**Enlisted**	
44	SPC	$34,190
45	PFC	$28,670
46		
47	**Salary Increase**	
48	% Inc/Yr	0.5%

Table 5 Annual Compensation by Rank

The calculation of operation, maintenance and support personnel costs for Comanche was completed in three steps. First the total unit salary for the three types of personnel was determined by multiplying the annual compensation of each rank by the quantity of personnel of the respective rank in the corresponding personnel category. Table 6 shows the results of this calculation for the personnel of a light Attack battalion. The total annual compensation was calculated in the same manner for the other types of units that will be Comanche equipped.

		Light Attack		
Rank	SALARY	Operation	Maintenance	Support
LTC (O-5)	$ 118,424	$ 118,424	$ -	$ -
MAJ (O-4)	$ 100,486	$ 200,972	$ -	$ -
CPT (O-3)	$ 79,342	$ 238,026	$ 79,342	$ 634,736
1LT (O-2)	$ 62,339	$ 498,712	$ -	$ 62,339
CW4 (W4)	$ 89,271	$ 178,542	$ -	$ 178,542
CW3 (W3)	$ 79,758	$ 717,822	$ 79,758	$ -
CW2 (W2)	$ 67,115	$ 1,610,760	$ 469,805	$ 67,115
CSM/SGM (E-9)	$ 77,207	$ -	$ -	$ 77,207
1SG/MSG (E-8)	$ 66,280	$ -	$ -	$ 397,680
SFC (E-7)	$ 56,865	$ -	$ 454,920	$ 227,460
SSG (E-6)	$ 48,821	$ -	$ 341,747	$ 439,389
SGT (E-5)	$ 40,729	$ -	$ 325,832	$ 610,935
SPC (E-4)	$ 34,190	$ -	$ 957,320	$ 923,130
PFC (E-3)	$ 28,670	$ -	$ 602,070	$ 716,750
Total Salary By Category		$ 3,563,258	$ 3,310,794	$ 4,335,283

Table 6 Unit Personnel Cost based on manning levels for operation, maintenance and support personnel

The second step in computing the mission personnel costs was to correlate the annual unit costs determined in step one to the unit "standup" schedule. The personnel costs for each unit were initiated the year they were originally fielded aircraft assuming that even if the unit does not receive all of their aircraft during the same year, the unit will still have full manning levels.

To compute the personnel costs the annual unit costs were multiplied by the number of units of the specific type that were operational in the respective year. This total value was also multiplied by the annual salary increase to obtain the cost for the specific type of personnel in constant dollars. The formulas used to calculate the costs for operational, maintenance and support personnel in the Manning DSW for the first year (FY02) are shown below.

Operational Personnel Costs[1] =

(1+SalInc)^A23*((B26*LAOpCost)+(B29*HAOpCost)+(B32*DCOpCost)+ (B35*RASOpCost)+(B38*SOAROpCost)+ (B41*TRADOpCost))

[1] LAOpCost, HAOpCost, DCOpCost, RASOpCost, SOAROpCost, TRADOpCost represent the annual cost of operational personnel for the respective type of unit.

Maintenance Personnel Costs[2] =

(1+SalaryInc)^A23*((B26*LAMaintCost)+(B29*HAMaintCost)+ (B32*DCMaintCost)+(B35*RASMaintCost)+(B38*SOARMaintCost)+ (B41*TRADMaintCost))

Support Personnel Costs[3] =

(1+SalaryInc)^A23*((B26*LASuppCost)+(B29*HASuppCost)+ (B32*DCSuppCost)+(B35*RASSuppCost)+(B38*SOARSuppCost)+ (B41*TRADSuppCost))

The same equations were used in subsequent years except the exponent for the salary increase factor is raised by one each year.

The costs for each personnel area were then totaled for each year and converted to current year dollars (FY02) using the normal discount rate and the formula below.

Total Annual Personnel Cost = B46/((1+DiscRate)^B23)

2. Training Costs

Training costs are another cost element included in O&S costs. It is necessary to plan the training of personnel carefully to ensure the required expertise is available at the proper time to operate and maintain the Comanche. To estimate the Comanche training costs it is necessary to first identify the specialty areas requiring training. In order to properly operate and maintain the Comanche there are six specialties requiring Comanche specific training. These six specialties along with the corresponding number of personnel per unit type requiring the specific training are shown in Table 7.

[2] LAMaintCost, HAMaintCost, DCMaintCost, RASMaintCost, SOARMaintCost, TRADMaintCost represent the annual cost of maintenance personnel for the respective type of unit.

[3] LASuppCost, HASuppCost, DCSuppCost, RASSuppCost, SOARSuppCost, TRADSuppCost represent the annual cost of support personnel for the respective type of unit.

	Unit Specialty Requirements/Unit					
Specialty	Lt Attack	Hvy Attack	Div Cav	RAS	SOAR	TRADOC
Pilot (CO)	20	21	13	22	4	2
Pilot (WO)	43	43	43	70	33	31
Instructor Pilot (CO)	0	0	0	0	0	1
Instructor Pilot (WO)	9	3	8	11	3	31
Maintenance Pilot (CO)	1	1	1	1	1	0
Maintenance Pilot (WO)	8	8	7	8	2	0
Maintainer (67C) (NCO)	24	13	24	31	22	0
Maintainer (67C) (Enl)	41	16	26	52	0	0
System Repairer (68C) (NCO)	8	6	11	18	12	0
System Repairer (68C) (Enl)	14	7	17	28	2	0
Structure Repairer (68G) (NCO)	2	3	2	5	2	0
Structure Repairer (68G) (Enl)	3	2	5	8	1	0

Table 7 Unit Specialty Training Requirements

All of the Comanche specialty training courses will be completed at the United States Army Aviation Center at Fort Rucker, Alabama. Each of the specialty courses have varying durations, ranging from 9 weeks to a maximum of 26 weeks for the Comanche system repairer course. The currently planned course durations are listed in Table 8.

	Weeks Required		
	Officer	NCO	Enlisted
Aircraft Transition	10	0	0
Maintenance Test Pilot Course	10	0	0
Instructor Pilot Course	10	0	0
Comanche Maintainer (67C)	0	9	9
Comanche System Repairer (68C)	0	26	26
Structure Repair (68G)	0	13	13

Table 8 Comanche Training Course Durations “After Ref. [18]”

The costs for each training course shown in Table 3.7 cover all materials, simulator operations and virtual computer training associated with the course as well as billeting and salary for the individuals while attending the course. The compensation for course instructors is often included in this cost element, but for ease of modeling, the instructor compensation is instead included in the personnel cost element.

	Cost/Week		
	Officer	NCO	Enl
Aircraft Transition Course	$ 3,000	$ -	$ -
Maint Test Pilot Course	$ 2,500	$ -	$ -
Instructor Pilot Course	$ 2,500	$ -	$ -
Maintainer School (67C)	$ -	$ 1,700	$ 1,500
Repairer School (68C)	$ -	$ 1,100	$ 900
Structure Repair School (68G)	$ -	$ 1,700	$ 1,500

Table 9 Comanche Training Course Weekly Costs

The first step in computing the Comanche training costs was to determine the training course costs per individual for each of the different training courses. This was accomplished by multiplying the course duration by the weekly cost for the respective course. The results of these computations are depicted in Table 10.

Training Cost (Individual)	Aircraft Transition	IP Course	Maint Pilot Course	Maintainer School (67C)	Repairer School (68C)	Structure Repair School (68G)
Commissioned Officer	$ 30,000.00	$ 25,000.00	$ 25,000.00	$ -	$ -	$ -
Warrant Officer	$ 30,000.00	$ 25,000.00	$ 25,000.00	$ -	$ -	$ -
NCO	$ -	$ -	$ -	$ 15,300.00	$ 28,600.00	$ 22,100
Enlisted	$ -	$ -	$ -	$ 13,500.00	$ 23,400.00	$ 19,500

Table 10 Training Course Costs per Individual

The second step in computing training costs is the determination of how many personnel will receive training each year. The scheduling of training for individuals is based on the fielding schedule of the Comanche. The personnel slated for assignment to a Comanche unit will be trained in the fiscal year prior to unit "stand up". Another dimension impacting the number of personnel requiring training is personnel retention. The author assumed that each year 30% of the officers, 20% of the NCOs and 40% of the enlisted personnel would depart the Comanche units due to retirement, end of service commitment, medical reasons or to pursue other avenues within the military. This requires the additional training of replacement personnel to fill these positions. Personnel that merely move from one Comanche equipped unit to another have already received their training and are not required to attend the respective training course again.

Starting with the next section the modeling of each specialty training area is described in detail. This includes the determination of training requirements and the computation of costs for each area.

a. Aircraft Transition Course

The first specialty required in a unit is the aircraft pilot. Both commissioned and warrant officers will be trained as pilots of the RAH-66 Comanche at a cost of $30,000 per pilot. To become qualified as a Comanche pilot, each aviator must complete a ten-week aircraft transition course. This course is set up to provide pilots previously trained on other types of aircraft; the basic skills required to safely operate the RAH-66 Comanche helicopter.

The number of Comanche helicopters being fielded to each unit range from nine to forty-eight. The Table of Authorization identifying the manning level for a unit is directly related to the number of systems the unit is equipped with. Therefore, the training requirements for each unit will vary based on the authorized manning levels. The determination of yearly aircraft transition course requirements was accomplished by multiplying the number of pilots required in a specific type of unit by the number of units of that type "standing up" in that year. This was done for each type of unit and summed for a total training requirement. To take into account the additional training required for replacement personnel, the appropriate personnel attrition rate was multiplied by the number of pilots in units "stood up" before the year under consideration. The following equation computes the number of personnel that must complete the aircraft transition course in FY 02 to meet unit pilot manning requirements in the following year.

Personnel Requiring Pilot Training[4] =

(C$12*LAPilotCO)+(C$15*HAPilotCO)+(C$18*DCPilotCO)+
(C$21*RASPilotCO)+(C$24*SOARPilotCO)+(C$27*TRADPilotCO)+
((1-OffAttrit)*((B$14*LAPilotCO)+(B$17*HAPilotCO)+
(B$20*DCPilotCO)+(B$23*RASPilotCO)+(B$26*SOARPilotCO)+
(B$29*TRADPilotCO)))

The same equation was utilized for subsequent years to determine the number of commissioned and warrant officers requiring pilot training in order to meet unit requirements.

The above computation provided the number of commissioned officers requiring training by year. These were then converted to dollars by multiplying the number of commissioned officers requiring training by the individual aircraft transition course cost shown in table 3.8. The equations for the calculation of aircraft transition course costs for the first year (FY 02) is shown below.

Aircraft Transition Course Annual Cost = B34*ATCostCO

The same basic equations were used to compute the costs to send the required number of warrant officers to the aircraft transition course. The total training costs for both commissioned and warrant officers were then converted from current dollars to constant dollars using the same that was used to discount personnel costs.

b. Instructor Pilot Course

The second specialty required in each unit is the instructor pilot. The instructor pilots have two responsibilities in Army aviation. First, they are the instructors for the aircraft transition course; and second, they assist in the advanced training of pilots that takes place in the operational units. The number of instructor pilots in each unit also varies based on the number of aircraft assigned to the unit.

[4] LAPilotCO, HAPilotCO, DCPilotCO, RASPilotCO, SOARPilotCO, TRADPilotCO are the number of commissioned officer pilots required in each type of unit

In order to become qualified to perform duties as an instructor pilot, a pilot must be selected for and complete the instructor pilot course. This is a ten-week course covering advanced aircraft systems and teaching techniques.

The methodology behind the computation of instructor pilot course costs is the same as that used for the aircraft transition course. The equations for determining the number of personnel requiring training and then the conversion to dollars are shown below.

Personnel Requiring Instructor Pilot Training[5] =

(C$12*LAIPCO)+(C$15*HAIPCO)+(C$18*DCIPCO)+(C$21*RASIPCO)+(C$24*SOARIPCO)+(C$27*TRADIPCO)+((1-OffAttrit)*((B$14*LAIPCO)+(B$17*HAIPCO)+(B$20*DCIPCO)+(B$23*RASIPCO)+(B$26*SOARIPCO)+(B$29*TRADIPCO)))

Instructor Pilot Course Annual Cost = B37*IPCostCO

Once again, the same process was completed to compute and discount the costs for providing warrant officers instructor pilot training.

c. Maintenance Test Pilot Course

The third specialty required in the Comanche unit is the maintenance test pilot. These are individuals that assist in the diagnosing of problems and are responsible for the completion of a post maintenance test flight to return an aircraft to operational status.

To become qualified to perform these duties a pilot must complete the 10-week maintenance test pilot course. This course is broken into two parts: classroom instruction covering advanced aircraft systems, and flying portion where the pilot receives instruction on the proper completion of maintenance test flights.

[5] LAIPCO, HAIPCO, DCIPCO, RASIPCO, SOARIPCO, TRADIPCO are the number of commissioned officer instructor pilots required in each type of unit.

As with the basic pilot and instructor pilot, the number of maintenance test pilots will vary in each unit based on the number of aircraft. The methodology for computing the training costs is the same as that used for the other two pilot specialties as indicated by the equations below that were utilized for the computation of maintenance test pilot course training costs.

Personnel Requiring Maintenance Test Pilot Training[6] =

(C$12*LAMTPCO)+(C$15*HAMTPCO)+(C$18*DCMTPCO)+
(C$21*RASMTPCO)+(C$24*SOARMTPCO)+(C$27*TRADMTPCO)+
((1-OffAttrit)*((B$14*LAMTPCO)+(B$17*HAMTPCO)+
(B$20*DCMTPCO)+(B$23*RASMTPCO)+(B$26*SOARMTPCO)+
(B$29*TRADMTPCO)))

MTP Course Annual Cost = B40*MTPCostCO

The same basic equations were used for each subsequent year for both commissioned officers and warrant offices and then discounted back to FY 02 dollars to provide a net present value for maintenance test pilot course costs.

d. Comanche Maintainer Course (67C)

This is the first specialty area that is strictly filled by non-commissioned officers and enlisted personnel in the Comanche unit. The Comanche maintainer holds the military occupation specialty (MOS) of 67C. The aircraft maintainer is often referred to as the crew chief and is responsible for the day-to-day upkeep of the aircraft. Due to the Comanche's increased emphasis on maintainability, the crew chief is primarily responsible for the change out of line replaceable units (LRU) with minimal time spent on minor repairs of components.

The crew chief must attend the nine-week Comanche maintainer course to become qualified as a Comanche maintainer. This course is somewhat shorter than the

[6] LAMTPCO, HAMTPCO, DCMTPCO, RASMTPCO, SOARMTPCO, TRADMTPCO are the number of commissioned officer maintenance test pilots required in each type of unit.

maintainer courses for other Army aircraft, due to the increased maintainability of the Comanche. In the Comanche maintainer course, the prospective crew chief will receive instruction on the aircraft systems and the operation of the aircraft fault diagnostic system. The fault diagnostic system has two parts: a built in test system that provides real time information on the health of components within the helicopter, and a portable diagnostic aid that can be connected to the aircraft to provide more detailed diagnostic and fault isolation capability.

Each unit is normally authorized at least one crew chief per aircraft, except for the TDA unit at Fort Rucker, Alabama. This unit supports the aircraft transition, instructor pilot and maintenance test pilot courses. The maintenance for the aircraft assigned to this unit is contracted out, and no military maintenance personnel are required. For the other operational units, the crew chiefs vary in rank from private first class (E-3) to sergeant first class (E-7). The crew chiefs assigned to the Special Operations Aviation Regiment (SOAR) are typically of a higher rank than operational aviation units found in the rest of the Army.

Even though this specialty area concerns only NCOs and enlisted personnel, the methodology behind computing the training costs was the same as that used in computing the costs for specialty pilot training. Below are the equations used to first determine the number of NCOs requiring maintainer training, and second the conversion of personnel to funds required for maintainer training. The same basic equations were utilized for the enlisted personnel as well.

Personnel Requiring 67C Maintainer Training [7]=

(C$12*LA67CNCO)+(C$15*HA67CNCO)+(C$18*DC67CNCO)+
(C$21*RAS67CNCO)+(C$24*SOAR67CNCO)+(C$27*TRAD67CNCO)+
((1-NCOAttrit)*((B$14*LA67CNCO)+(B$17*HA67CNCO)+
(B$20*DC67CNCO)+(B$23*RAS67CNCO)+(B$26*SOAR67CNCO)+
(B$29*TRAD67CNCO)))

67C Maintainer Course Annual Cost = B43*Cost67CNCO

[7] LA67CNCO, HA67CNCO, DC67CNCO, RAS67CNCO, SOAR67CNCO, TRAD67CNCO are the number of MOS 67C non commissioned officers required in each type of unit.

These results were then combined with those of the enlisted personnel to give the total Comanche maintainer course costs for the first year. The costs for subsequent years were computed in the same manner and discounted using the normal discount rate.

e. Comanche Repairer Course (68C)

The fifth specialty area is that of Comanche repairer, designated as MOS 68C. The Comanche repairer is responsible for the repair of components at the organizational level. These individuals receive more advanced training than the Comanche maintainer on the aircraft systems and have the ability to repair many of the components that are beyond the training or capabilities of the aircraft crew chief. In order to gain this level of knowledge, the personnel must complete a 26-week training course at Fort Rucker, Alabama.

The Comanche is being designed for only two levels of maintenance, organizational and depot. The exclusion of an intermediate level of maintenance results in a fewer number of repairers requiring training in comparison with other Army helicopters. Once again the TDA unit does not require any military repairers due to the contract for maintenance.

The equation used for determining the number of NCOs requiring training for the first year is shown below. The same basic equation is used for the enlisted personnel also.

Personnel Requiring 68C Repairer Training [8]=

(C$12*LA68CNCO)+(C$15*HA68CNCO)+(C$18*DC68CNCO)+
(C$21*RAS68CNCO)+(C$24*SOAR68CNCO)+(C$27*TRAD68CNCO)+
((1-NCOAttrit)*((B$14*LA68CNCO)+(B$17*HA68CNCO)+
(B$20*DC68CNCO)+(B$23*RAS68CNCO)+(B$26*SOAR68CNCO)+
(B$29*TRAD68CNCO)))

[8] LA68CNCO, HA68CNCO, DC68CNCO, RAS68CNCO, SOAR68CNCO, TRAD68CNCO are the number of MOS 68C non commissioned officers required in each type of unit.

The resulting NCO training requirements were converted to dollars using the following equation.

68C Repairer Course Annual Cost = B46*Cost68CNCO

These results were then combined with those of the enlisted personnel to give the total Comanche repairer course costs for the first year. The costs for subsequent years were computed in the same manner and discounted using the normal discount rate of 3.2%.

f. Structural Repairer Course (68G)

The last of the Comanche specialty areas is the structural repairer. The Comanche is designed for stealth operations using a low observable skin not found on any other Army aircraft. The structural repairer is responsible for repairing the skin as well as other structural components of the aircraft. After attending the 13-week structural repair course, personnel will have the capability to perform structural repair on the Comanche as well as other Army helicopters in the inventory.

The equation used for determining the number of NCOs requiring training for the first year is shown below. The same basic equation is also used for the enlisted personnel.

Personnel Requiring 68C Structural Repairer Training [9]=

(C$12*LA68GNCO)+(C$15*HA68GNCO)+(C$18*DC68GNCO)+
(C$21*RAS68GNCO)+(C$24*SOAR68GNCO)+(C$27*TRAD68GNCO)+
((1-NCOAttrit)*((B$14*LA68GNCO)+(B$17*HA68GNCO)+
(B$20*DC68GNCO)+(B$23*RAS68GNCO)+(B$26*SOAR68GNCO)+
(B$29*TRAD68GNCO)))

The resulting NCO training requirements were multiplied by the structural repair course cost found in Table 10 to obtain the total course cost for the respective year as shown in the following equation

68C Structural Repairer Course Annual Cost = B49*Cost68GNCO

[9] LA68GNCO, HA68GNCO, DC68GNCO, RAS68GNCO, SOAR68GNCO, TRAD68GNCO are the number of MOS 68G non commissioned officers required in each type of unit.

These results were then combined with those of the enlisted personnel to give the total Comanche repairer course costs for the first year. The costs for subsequent years were computed in the same manner and discounted using the normal discount rate of 3.2%.

3. Operation Costs

Although development and procurement costs are traditionally thought of as the cost drivers for a major weapon system, operation and especially maintenance costs

a. POL Costs

The Petroleum, oil and lubricants (POL) cost for the RAH-66 Comanche is based on the AH-64 Apache historical POL data found in the OSMIS database. The POL cost per flight hour for the Apache was consistently around 95 dollars, although it did drop down to 75 dollars during one of the years. This was considered an anomaly, and with the current world situation, the author assumed a POL cost of 95 dollars per hour for the Comanche. This includes not only the aviation fuel for the helicopter, but also the oil and lubricants required for the various hydraulic and engine systems.

The operational planning numbers being used by the Comanche program office are 18 hours per month for each aircraft in MTOE units and 30 hours per month for aircraft in the TDA unit. These average out to yearly totals of 216 and 360 hours per year for each aircraft in the respective units.

To calculate the total POL cost, the number of aircraft in operation was multiplied by the respective yearly operating hours to get the total operating hours for both MTOE and TDA units. This was then multiplied by the hourly POL cost, which results in the total annual cost for POL. Due to the volatility of fuel prices in the world, the author assumed a 2% annual increase in fuel prices over the total life of the system. These steps are combined in the equation shown below used to calculate fuel costs for the first year.

Annual POL Cost [10]=

(POL*(1.02)^C48)*((C69*FHOpYear)+(C74*FHTDAYear))

The user has the flexibility to vary the hourly fuel cost and the quantity of aircraft operational in a given year by changing the values located on the appropriate reference worksheets.

b. Training Ammunition Costs

One of the missions the Comanche helicopter will perform in operational units is the attack mission. In order to perform this mission effectively, the aircrew must undergo weapons training. This begins with basic weapons training in the aircraft transition course and continues with semi-annual gunnery exercises in the operational unit. The cost of training ammunition includes the cost of replacing or increasing stocks of ordnance expended by units during peacetime training and gunnery exercises for the purpose of sustaining aircrew proficiency in weapons system delivery.

In computing the total cost for Comanche training ammunition, the author used a figure of $50,000 per year for each aircraft. This number is based on AH-64 Apache historical training ammunition costs listed in the OSMIS database. The Apache has similar weapon systems and similar weapons system training requirements to the Comanche. The equation shown below provides the annual training ammunition costs per aircraft for the year under consideration. This is obtained by multiplying the ammunition cost per aircraft by the number of aircraft operational in that particular year.

Training Ammunition/Missile Cost = Ammo*(C69+C74)

The above calculation is included on the O&M DSW, and is combined with the POL costs to makeup the Comanche operation costs. The operation cost element in the Comanche model is similar to the unit level consumption cost element in the CAIG's generic aircraft cost structure except for the exclusion of maintenance in the

[10] FHOpYear and FHTDAYear are the annual flight hours per aircraft for MTOE and TDA aircraft respectively

Comanche model under this cost element. In the Comanche model, maintenance is modeled as a separate cost element to facilitate analysis.

4. Maintenance Costs

The total maintenance cost for the Comanche helicopter consists of many elements funded with O&M appropriation dollars, to include contractor logistics support and sustaining support. This section only covers the costs incurred from the conduct of organizational and depot level maintenance as the contractor logistics support and sustaining support are broken out as separate cost elements described later in this chapter.

The Comanche is being designed for two levels of maintenance, organizational and depot. The actual amount of maintenance the depot maintenance facility will perform is contingent on the Contractor Logistics Support contract currently planned for the Comanche. This contract calls for all maintenance and services to be provided by the contractor for the years 2005 through 2011. If the contract is extended, the depot maintenance facility would perform little, if any of the maintenance required on the Comanche. The author assumed that the contract extension would not occur in developing this model, and the depot maintenance facility would perform a portion of the maintenance above organizational level after the year 2011.

The maintenance cost of the Comanche is driven by the quantity of unscheduled and essential maintenance actions that occur, or reliability of the system. The Comanche reliability was modeled according to the bathtub curve depicted in Figure 10. This entails an initial reliability that is 15% worse than the predicted goal and improvement over a three-year burn-in period to reach the predicted level. At the 18^{th} year of service the failure rate would increase again as the wear out stage is reached.

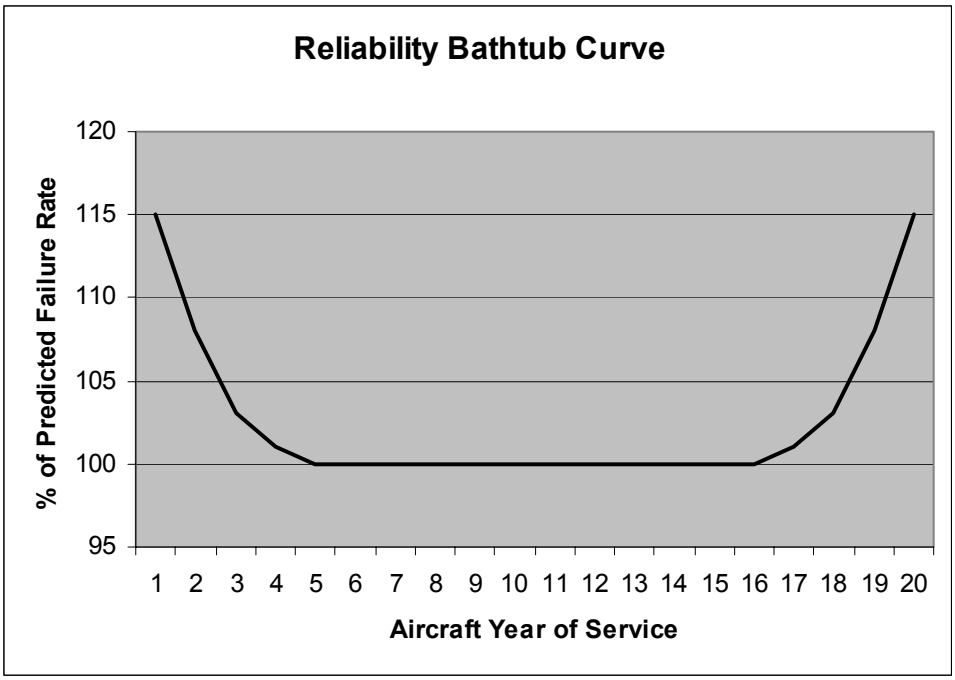

Figure 10 Comanche Bathtub Curve

Each maintenance action has an associated cost for repair parts, either consumable or DLR in addition a surcharge, general and administrative overhead and transportation costs are included depending on the level of maintenance the work is performed. To determine the number of expected maintenance actions annually for each aircraft the total operating hours for the operational units and TDA unit were divided by the MTBUMA and MTBEMA factors. This resulted in the number of unscheduled and essential maintenance actions expected per aircraft for the respective types of units in a year time frame.

In the following sections, the methodology is provided for the estimating of costs for consumables, DLRs, Depot level maintenance and transportation costs.

a. Consumables

With each maintenance action there are associated costs for consumable material. This cost can vary depending on the specific type of failure, and the component that failed. This model uses an average cost of consumables for each failure in a system.

For example, any failure in the aircraft electrical system, a consumables cost of $939 dollars is accumulated. The average consumables costs were derived from cost data provided by the Comanche program office O&S cost estimators. The average consumables costs were then multiplied by the number of failures expected for each aircraft annually, resulting in the total cost for consumables per year for each aircraft. This amount is then multiplied by the quantity of aircraft in operational and TDA units to obtain the total consumables cost for the entire Comanche fleet in a particular year.

The model breaks down cost of consumables based on the type of maintenance action that occurs, essential or unscheduled. Although essential maintenance actions are a type of unscheduled maintenance action, the costs are calculated separately to provide further insight into the breakdown of costs. The computations of consumable costs for essential and unscheduled maintenance actions are shown in the equations below.

EMA Consumables Cost = G69*Q44+G74*S44

UMA Consumables Cost =

H86=G69*(M44-Q44)+G74*(O44-S44)

Computing the cost of consumables in this manner makes the outcome dependent on the reliability of the system. The more faults the aircraft experiences, the greater the cost for consumables.

b. Depot Level Repairable (DLR)

The logic behind the estimation of costs for DLRs is similar to that used for estimating the cost for consumables. The primary difference is that DLRs are not "disposable items". Instead, they are costly parts or components that are more economical to repair and put back into the supply system for future use. In most cases partial credit is given to a unit when a faulty DLR is turned in and a new one is purchased. Therefore, the unit does not pay full price for a replacement part.

The total DLR costs correlate to the number of expected failures per aircraft and the number of aircraft operating in a particular year. The model breaks down the DLR cost based on the type of maintenance action that occurs, essential or unscheduled. The DLR cost for essential maintenance actions are computed separately from the DLR cost for unscheduled maintenance actions for analysis purposes only. Realistically, these costs are not accounted for separately. The computations of DLR costs for essential and unscheduled maintenance actions are shown in the equations below.

EMA DLR Cost = H85=G69*R44+G74*T44

UMA DLR Cost = H87=G69*(N44-R44)+G74*(P44-T44)

b. Depot Level Maintenance

In chapter II the different maintenance levels and their capabilities were described in detail. The planned two level maintenance setup for the Comanche will eventually require a larger quantity of depot level services than other Army helicopters. The utilization of the depot facilities will not occur until the year 2010 due to the planned CLS contract that has contractors performing all upper level maintenance until a contract phase out period beginning in 2010.

In estimating the costs for depot level maintenance, the costs for consumables and DLRs are not included. These cost components are included in the computations described in the above sections. The main cost for depot level maintenance included in this model is the labor cost associated with the work performed. To account for any overhead costs and surcharges common with depot level work, the author inflated the per hour labor rate to $400. It was necessary to account for these additional costs in this manner because there is no data available yet on the percentage of work that will be performed at the depot level. Therefore, the computations in the model are based on the assumption that 80% of the time necessary to repair components correlates to depot level work. The organizational maintenance will only have the capability to repair components 20% of the time.

The depot labor rate of $400 per hour was then multiplied by the predicted MTTR to get the labor cost associated with the repair of one failure. This was then multiplied by eighty percent of the number of expected failures resulting in the annual depot labor cost for a single aircraft. By multiplying this total by the number of aircraft in the operational and TDA units, the total depot cost was obtained for each particular year. The results of these computations are shown on the O&M DSW located in appendix B.

d. Transportation Costs

An additional cost of maintenance is the transportation costs associated with the shipment of parts. One of the primary ways the down time is being reduced for the Comanche is through removal and immediate replacement of faulty parts. This negates the time normally experienced with lengthy repair and reinstallation of components associated with other aircraft. The removed components or DLRs, are then shipped to the contractor or depot for repair and shipped back to the units once repair is complete. For operational units and the TDA unit, the current reliability predictions result in 120 and 188 unscheduled maintenance actions (UMA) per year respectively for each aircraft. Since this model only broke the Comanche down to the system level and not into line replaceable units (LRU), the author assumed that each UMA would encompass at least one DLR requiring repair at either a contactor or depot facility.

A transportation cost of $150 per shipment was used in this model for all parts. This was derived from historical cost data found in the OSMIS database for other aircraft. This amount covers the costs associated with the packing material, insurance and shipping for each DLR to and from the repair facility.

5. Contractor Logistics Support

As explained in chapter two, contractor logistics support is the providing of all maintenance and logistic support by an external organization. This includes the initial stock of spare parts and performance of required maintenance. Currently, the Comanche

program office has let a contract CLS starting in 2005 and ending in 2011. Although this contract is initially set for only seven years, the possibility exists for the renewal of the contract in 2011 if cost savings are experienced. In order for this to happen, the program office will have to find a way to get around the law that requires 50 percent of depot level maintenance to be performed by a Government depot facility.

The actual modeling of contractor logistics support is extremely difficult without in depth knowledge of the actual contractual provisions. In addition, the contractor is incentivized to improve system reliability during the performance of the contract, so the actual cost could change dramatically. Due to these factors, the cost for CLS utilized in the Comanche model was not derived through mathematical means. Instead, the costs were based on projections obtained from the Comanche program office.

6. Sustaining Support

The final cost element considered in the Comanche model is the sustaining support costs. These costs are not directly associated with the maintenance and upkeep of the aircraft. Instead, they are costs incurred to upgrade the technology and software so the Comanche can remain an effective weapon system able to provide the capability needed in the future military environment. There are two primary contributors to the sustaining support cost, software support and systems engineering.

a. Software Support

The Comanche helicopter is the most software intensive helicopter ever developed with over one million lines of code to make the systems operate as intended. In the other helicopters in the Army inventory, most of the systems consist of primarily mechanical parts, with a small amount of software to enhance the functionality. The Comanche has replaced many of these mechanical parts, such as in the flight control system, to rely primarily on software to control the system. Along with the dependency of each system to operate with software, there is also an embedded diagnostic software component that provides real time system status to the pilots and maintainers. Although

the integration of software into the systems provides capabilities unobtainable with mechanical components, it will require significant time and effort to debug and upgrade the software. Since the reliance on software with the Comanche is so great in relation to other helicopters, it would be very difficult to parametrically estimate the costs associated with Comanche software support from those experienced with other aircraft. Therefore, the software support costs used in the Comanche model are based on projections obtained from the Comanche program office.

b. System Engineering

The modification and upgrade of the Comanche helicopter must occur in a systematic and controlled manner in order for the aircraft systems to work properly. Even a minor change in one system can affect the functioning of another system or the aircraft as a whole. The responsibility of the systems engineering element is to integrate all upgrades and modifications into the design of the system without adversely affecting the functioning of other system components.

Similar to the software support costs, it is extremely difficult to develop a mathematical equation to estimate the costs for system engineering required for the Comanche. System engineering costs are not based on any predictable factor such as aircraft hours or component failures. Instead, they are based on expected, but unpredictable future upgrades and modifications the Comanche will receive. Therefore, the systems engineering costs used in this model are also based on the predictions obtained from the Comanche program office. The inclusion of system engineering costs was mainly to provide a more accurate estimate of total O&S costs and; thus, a detailed breakdown was not necessary for this exercise.

7. Total Operation & Support Costs

The final step in calculating total O&S costs for the Comanche helicopter was to compile the results from the six cost elements described above onto one worksheet. This was completed on the O&S cost DSW, which can be seen in Appendix B. This DSW

allows the user to see the percentage breakdown of O&S costs by major cost element in both numerical and graphical format. The actual results of the model and analysis are covered in chapter four of this thesis.

D. OPERATIONAL AVAILABILITY (A_O)

As explained in Chapter II, operational availability is the probability that an aircraft is in operational condition at any random point in time. Often time operational availability is confused with operational readiness, which is the percent of total time that an aircraft is in operational status. The basic difference is that operational availability is a prediction of future capability while operational readiness is a recap of what has already happened. Operational availability is a key performance measure for all weapon systems for one simple reason; it doesn't matter how much a system costs, or how technologically advanced it is, if the weapon system is not operational.

There are two primary factors that impact the Ao of a weapon system; the reliability, measured in mean time between failure, and the maintainability, measured in mean time to repair. As explained in chapter two, there are a couple different types of failures that the Comanche can experience, unscheduled and essential. For the Comanche, essential failures are those that will cause the Comanche to lose operational capabilities and require repair before full aircraft operational status is returned. Therefore, the computation of Ao in the Comanche model is based on the reliability and maintainability measurements associated with essential failures only.

A key rule that must be followed when conducting sensitivity analysis is ceteris paribus. This is where only one variable can be changed at a time, while all others remain constant. To remain consistent with this rule in the modeling of Ao, the DSW was divided into six different tables. The first table of the DSW shows the computations of Ao during peacetime for operational units, allowing for variability in the reliability measurement, MTBEMA. The second table is the computation of Ao during peacetime for MTOE aircraft, allowing for variability of the maintainability measurement, MTTRe. The third and fourth tables are the same as tables one and two, except they compute the

Ao for the TDA aircraft, while the fifth and six tables compute Ao for MTOE aircraft during wartime. The TDA unit is a training unit that is non deployable during wartime situations. Therefore, Ao for the TDA aircraft would be the same in peacetime and wartime.

To compute the Ao for each of the situations the author used the Ao equation shown in Chapter II. The equation, as used in the DSW is shown below for the computation of Ao in peacetime with varying reliability.

Operational Availability [11]=

1-(FHOpYear/8760)* (('AdjustedR&M'!J102+ALDTPeace)/A6)

There are four major components in this equation that can affect the Ao of the aircraft. The first is the projected annual flight hours for the Comanche. According to the Comanche program office the monthly flight hour projections for peacetime are 18 and 30 hours per aircraft respectively for operational and TDA units. These equate to yearly flight hour totals of 216 and 720 hours respectively. During wartime a flight time projection of 183 hours per month, 2196 hours per year is used for aircraft in operational units. These are then compared to 8760 hours, the total number of hours in a year to obtain a percentage of operational hours versus total hours.

The second component is the aircraft reliability, expressed as MTBEMA. The current projected MTBEMA for the Comanche is 4.78 hours for peacetime and wartime operations. This value is a reliability prediction obtained from the Comanche program office and it represents the reliability for the total system.

The third component affecting the Comanche Ao is the administrative logistical delay time. The Comanche program office predicts ALDT values of 22 and 3.4 hours respectively for peacetime and wartime situations. These values account for the total time necessary to order and receive repair parts necessary to fix a broken aircraft. ALDT is dependent on the efficiency of the logistical system established for acquiring replacement parts. Although the Comanche is being designed for two levels of

[11] ALDTPeace is the administrative logistical downtime. This encompasses the time to complete activities other then hands on maintenance in the repair of an item.

maintenance, the logistical support system will be the standard three-level system common throughout the Army.

The final component impacting the Ao of the Comanche is the maintainability, expressed as MTTRe. The most current projections for MTTRe are 1.12 and 1.4 hours respectively for peacetime and wartime operations. This represents the total time to diagnose faults, remove faulty components if necessary, and install operational components. This value may vary somewhat depending on the design elements that are included in the final design of the Comanche. The available time and funding are the major drivers of what design elements will be included in the end.

E. CHAPTER SUMMARY

In constructing the Comanche cost and availability model the author attempted to develop mathematical equations representing the actual operation and maintenance of the aircraft over the useful life. This chapter provided information on the methodology and logic behind those equations as well as assumptions that were necessary. The next chapter presents the results of the model through simulation using the Crystal Ball software and the sensitivity analysis performed on differing reliability and maintainability values of the Comanche.

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IV. RESULTS AND ANALYSIS

A. CHAPTER OVERVIEW

Thus far, this thesis has discussed the generic cost estimating process and how that process was applied in developing an O&S cost estimation model for the Comanche helicopter. This chapter will complete the process by providing the results and analysis of the model simulation. The Comanche program has been criticized several times in GAO reports for perceived inability to meet reliability and maintainability goals.[Ref. 36] The analysis conducted in this body of research will provide insights into the impact of not meeting the prescribed goals.

B. SIMULATION OF THE COMANCHE MODEL

There are some uncertainties related to the estimation of the Comanche O&S costs and Ao. The major uncertainties highlighted in the running of simulations were the reliability and maintainability of the aircraft components. As discussed in the previous chapter, the reliability and maintainability values are not discrete measurements. Instead, they are averages of times based on random distributions. In order to properly model the effects of reliability and maintainability, the author used Crystal Ball simulation software. With this software, the reliability and maintainability measures were represented as normal distributions. This will result in a more realistic estimate of O&S costs for the Comanche using the constructed model.

The Crystal Ball software has two unique characteristics that make it a very valuable tool. First, assumptions can be incorporated into the simulation through the designation of distributions and ranges. Second, Crystal Ball displays the results of a simulation in a forecast chart, which shows the entire range of of possible outcomes and the likelihood of achieving each of them. In essence, Crystal Ball provides a statistical picture of the range of possibilities inherent in our assumptions. [Ref. 28:p. 9]

In setting up Crystal Ball to run simulations, two tools were used; define assumption and define forecast. The define assumption tool allows for the representation

of uncertainty through the designation of desired types of distributions and ranges. For the Comanche model, the reliability and maintainability measurements were represented as normal distributions. The second tool used for the simulation was define forecast. This tool allows the user to identify which cells forecasts will be produced for. The forecasts show how the uncertainties identified in the assumptions affect the forecasted cell. In this case the user was concerned with the O&S cost elements. Since the user assumed no uncertainty in the factors affecting manning levels of the units, the cost of CLS or system sustainment, the results for these cost elements were constant values.

The simulation was then set to run for 2,000 trials, collecting data on each forecasted cell for each trial. The results of these simulations are covered in the following sections.

C. O&S COST MODEL RESULTS & ANALYSIS

The approach used to analyze the Comanche O&S costs started with the development of a cost estimation model in Microsoft Excel. Two thousand simulations of the model were then completed, assigning normal distributions to the reliability and maintainability measurements. This section provides the results of those simulations along with analysis of the results.

1. Manning Costs

The Comanche cost model produced a personnel cost estimate of $7,443,679,135 for the entire twenty-year useable life of the system. This amount comprised approximately 47% of the total O&S costs for the Comanche helicopter. Although this percentage is higher than that experienced with other aircraft systems it is consistent with the focus of the program. Normally the percentage would be lower because operation and maintenance costs are higher. In the case of the Comanche, the primary effort has been on reducing operation and maintenance costs. Thus, an in increase in the contributing percentage of personnel costs is expected, but the actual dollar amount is likely lower than that of other aircraft.

2. Training Costs

The average training costs resulting from the simulation were $748,920,706. The training costs vary because the annual retention rates of officers, NCOs and enlisted soldiers were modeled according to normal distributions. The forecasted range of outcomes resulting from the simulation are shown in Figure 11.

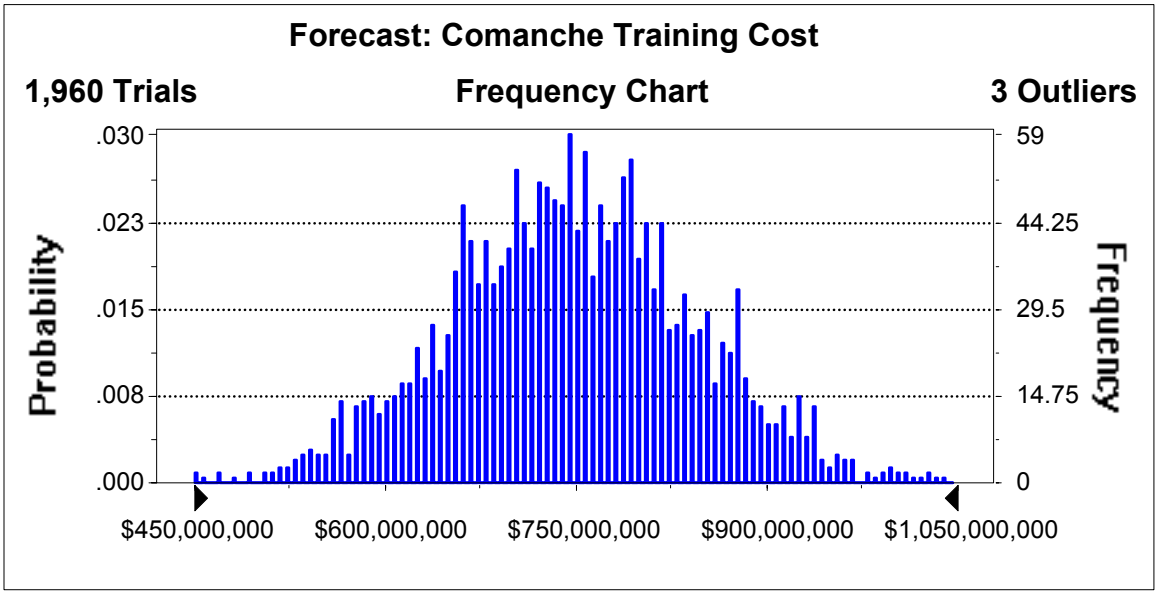


Figure 11 Simulation Results for Comanche Training Costs (Mean: $748,920, 706)

Training costs comprised only 5% of the total O&S costs for the Comanche. The primary reason why the training costs are low is because the Comanche will only have two levels of maintenance. This effectively eliminated the requirement to train the significantly large number of personnel that are normally assigned to the Intermediate level maintenance facility. Instead, the design of the Comanche only requires a limited number of personnel at the organizational and depot level to receive training.

Another factor driving the training cost down is the incorporation of computer based simulation training in many of the maintenance courses. Thus, allowing the students to complete some of the training on simulation devices instead of using actual aircraft parts. Although this training structure may not be appropriate for other aircraft, it is suitable for the Comanche, which is a software intensive aircraft. Hence, a significant portion of the maintainers' time will encompass utilization of the portable diagnostic

computer. Hands on maintenance will mostly consist of removal and replacement of parts and not the normal time intensive hands on maintenance associated with repair of other aircraft.

3. Operation Costs

The operation costs for the aircraft were only based on operation in peacetime conditions. In this environment, each unit has a flying hour program that is currently projected at 18 and 30 hours per month respectively for MTOE and TDA aircraft. This equates out to an annual flying hour projection of 216 and 360 hours respectively for MTOE and TDA aircraft. This resulted in an estimate of operational costs of $987,477,374, which is only 6% of the total O&S costs for the Comanche. This appears somewhat low, but there are a couple of reasons that may explain this occurrence. First, this cost only accounts for POL and training munitions. Second, this model only estimates costs in peacetime conditions. It is very unlikely that the aircraft will not see wartime service, but the incorporation of wartime conditions in this model would have introduced uncertainty that could bias the actual impact of reliability and maintainability.

4. Maintenance Costs

Of the seven cost elements covered in this research, maintenance costs are the cost element most affected by reliability and maintainability levels. Through a simulation consisting of 2,000 trials, the average resultant maintenance cost was $5,452,250,970. This is equal to 34% of the total O&S costs for the Comanche. The range of values for the forecasted maintenance cost is shown in Figure 12.

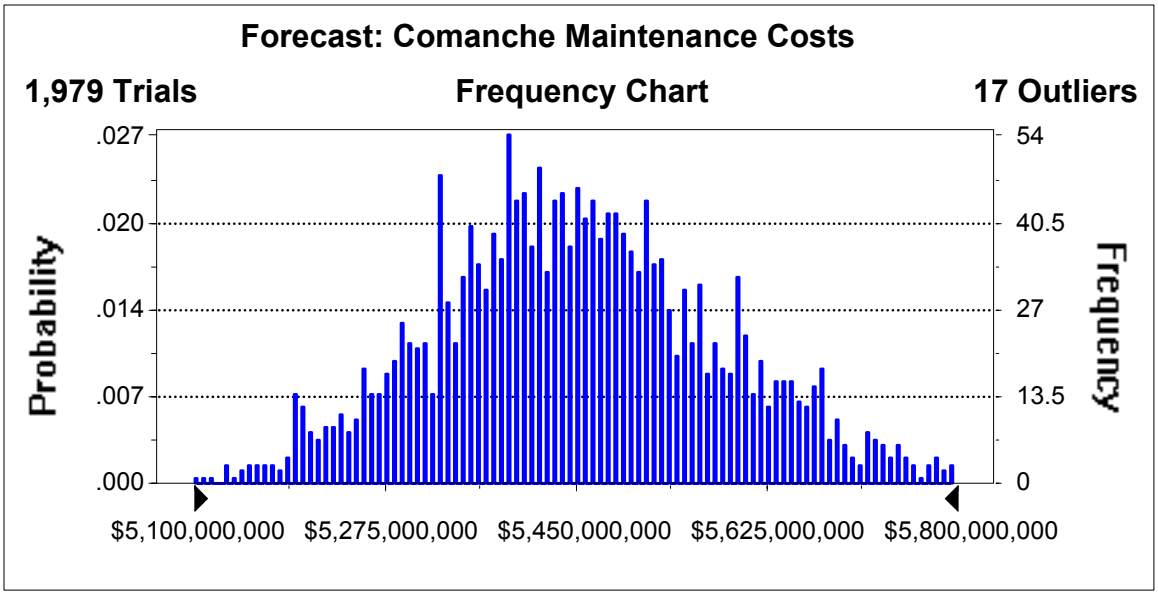


Figure 12 Simulation Results for Comanche Maintenance Costs (Mean: $5,452,250,970)

As discussed in the manning cost section, the lower contributing percentage of maintenance costs is indicative of the emphasis placed on designing not only a supportable aircraft, but also a good support system. The design of the aircraft lends itself to maintainability through easy access to all systems and minimization of required special tools to complete maintenance tasks.

The key to obtaining this low maintenance cost is reaching the predicted reliability goals. If these goals are not reached, the impact on maintenance costs will severely weaken the stance of the Comanche as a highly supportable aircraft.

5. Total O&S Costs

The total O&S cost as computed with the Comanche model is $15,896,117,34 for a total of 1213 aircraft fielded beginning in FY 2006 with a useable life of 20 years. The range of values for O&S costs from simulation of the model are shown in Figure 13.

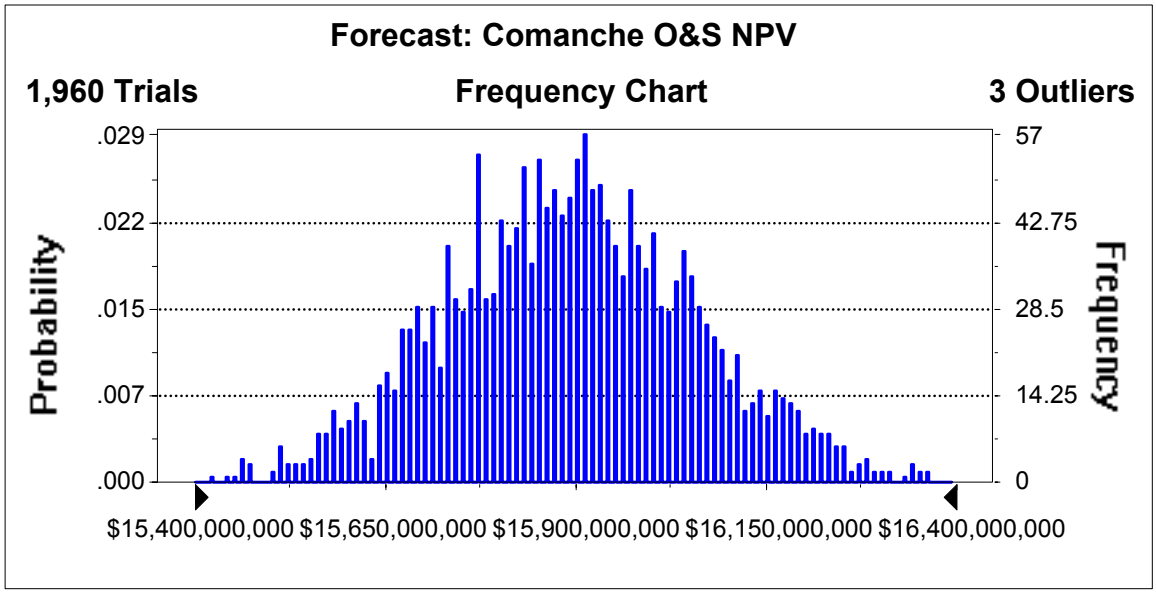


Figure 13 Simulation Results for Comanche O&S Costs (Mean: $15,896,117,534)

Although the resulting O&S cost estimate is quite low compared to other aircraft, it is consistent with estimates from the Comanche PMO as will be shown later in this chapter. Once again the proactive approach the PMO has taken in emphasizing the design of a reliable and maintainable aircraft appears to pay off in significantly lower O&S costs than those experienced by other aircraft systems. The driving factor behind the low O&S costs is the relatively low estimated maintenance costs for the aircraft. A reduction in O&S costs hinges on the obtainment of the predicted reliability and maintainability goals for the program.

Through simulation it was possible to determine the probabilities of experiencing different levels of O&S costs. As Table 11 indicates, there is almost an 80% probability that the O&S costs will be below $16 billion during peacetime operations if predicted R&M goals are reached by the fourth year of aircraft service. This shows that with reliability and maintainability values varying normally about the predicted values, the Comanche has a very good chance of experiencing low O&S costs.

Percentile	Value
0%	$15,359,175,724
10%	$15,685,551,403
20%	$15,754,959,219
30%	$15,807,612,738
40%	$15,854,674,327
50%	$15,894,595,584
60%	$15,934,405,984
70%	$15,980,356,862
80%	$16,037,882,306
90%	$16,107,952,585
100%	$16,442,982,859

Table 11 O&S Cost Probability Percentiles

D. COMPARISON OF RESULTS WITH PMO ESTIMATES

To validate the constructed model it is necessary to compare it with established estimates. According to a 1999 Comanche PMO estimate located in Appendix D, the total O&S cost for the Comanche is $16,951,100,000 in BY99 dollars. As shown in Table 12, this equals approximately a one billion dollar difference in estimates not taking into to account the different base year of dollars. Several possible explanations exist for the difference in the two estimates.

The first explanation is that the PMO estimate is over two years old and design improvements have caused some of the costs to decrease in that time frame. For example, projected manning levels are based on the number of aircraft being procured and the maintenance requirements for the aircraft. Improvements in reliability and maintainability over the past two years may have caused a decrease in the required manning levels in each unit.

Additionally, the bathtub curve as presented in Chapter II has a starting point that correlates with aircraft fielding. In reality the first phase of the bathtub curve, burn in, extends out to encompass the reliability improvements experienced before fielding. With design and technology maturation, the Comanche is already moving down the left side of the bathtub curve, requiring less improvement after fielding to meet the predicted

reliability and maintainability levels. Therefore, the estimated O&S costs for the Comanche should be lower now than with past estimates.

The differences in the CLS cost and System sustainment cost are also attributable to improvements in the design. One of the aspects of the CLS contract is the incentivization of reliability. Therefore, it is likely that the contractors have made a considerable effort towards proving their reliability predictions.

	PMO Estimate (FY99 $)	Model Estimate (FY 02 $)
Training	$608,700,000	$747,160,891
Manning	$7,507,600,000	$7,443,679,135
Operation	$1,551,500,000	$987,477,374
Maintenance	$5,952,100,000	$5,432,915,832
CLS	$628,700,000	$681,042,802
System Sustainment	$702,500,000	$582,917,554
Total	$16,951,100,000	$15,875,193,587

Table 12 Comparison of PMO Cost Estimate to Model Simulation Results

A key thing to note in comparing the two estimates is that the breakdown of costs is almost exactly the same as shown in Figures 14 and 15. The largest difference of any cost element is only three percent between the two estimates. This indicates that the methodology behind the constructed model is sound, and the difference is a result of the change in the values of the input over the two-year time frame between the estimates.

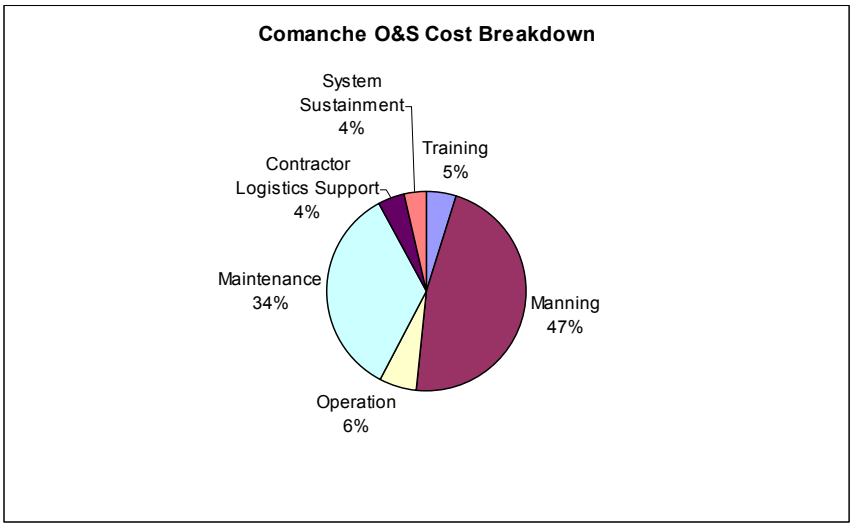


Figure 14 Comanche Model Cost Element Percentage Breakdown

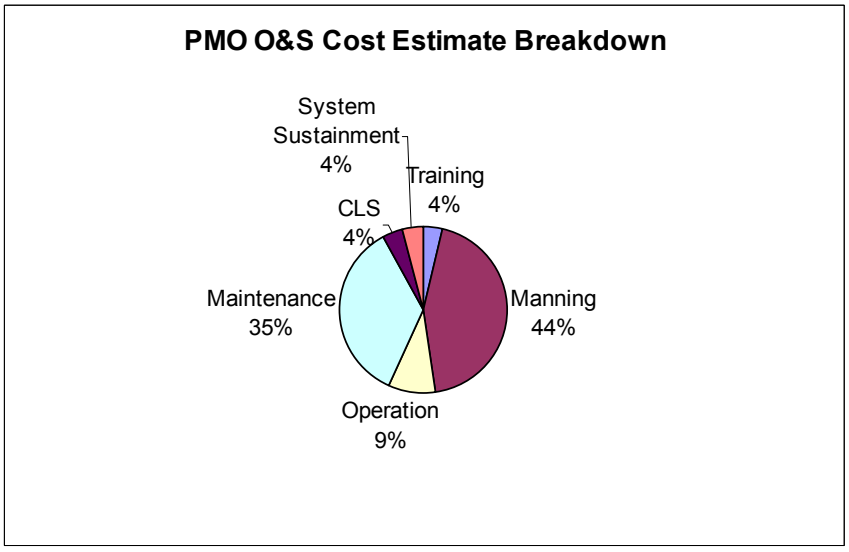


Figure 15 PMO Estimate Cost Element Percentage Breakdown

E. RELIABILITY AND MAINTAINABILITY

The primary goal of this research was to determine the sensitivity of O&S costs to variations from the predicted reliability and maintainability values. The biggest concern in this analysis was on the impact of not meeting the predicted goals vice the cost savings possible if the goals were exceeded. As indicated in Figures 16 and 17, O&S costs are more sensitive to reliability levels below predictions than maintainability levels below predictions.

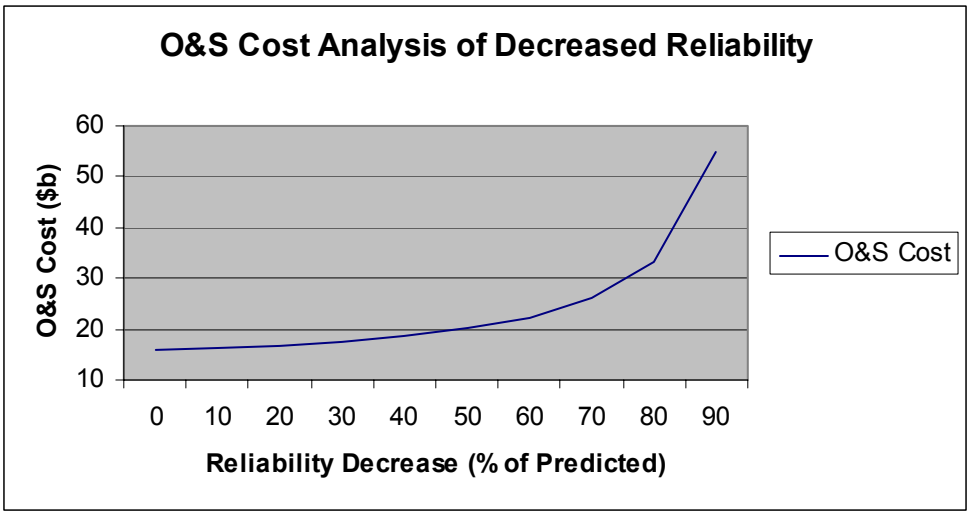


Figure 16 O&S Cost Sensitivity to Decreases in Reliability Below Predicted Values

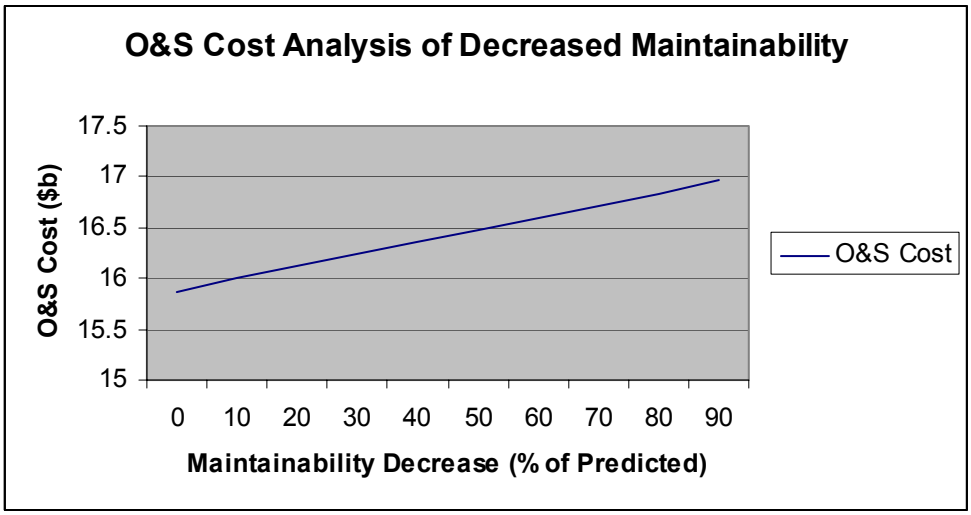


Figure 17 O&S Cost Sensitivity to Decreases in Maintainability Below Predicted Values

For each increment of 10% below predicted levels, up to 40%, the O&S cost increases by approximately 3%. Beyond a level of 40% below the predicted reliability goals, the O&S costs will begin to increase at an exponential rate. In comparison, failure to reach maintainability goals only causes a 1% increase in O&S costs for each 10% below predicted levels. This rate of increase remains constant throughout all values of maintainability below predicted. Figure 18 presents a side-by-side comparison of impact the two factors have on O&S costs. This graphical representation clearly shows that the

impact on O&S costs from reliability values greater than 20% below predicted is much more severe than that experienced from similar maintainability levels.

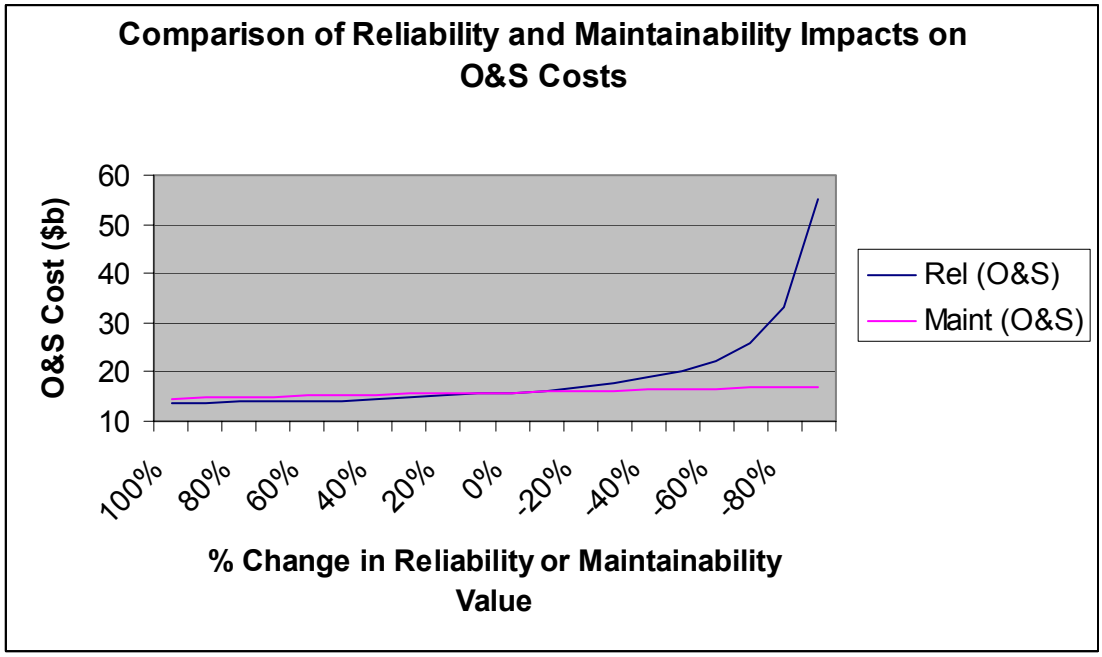


Figure 18 Comparison of Impact on O&S Costs from Varying Reliability and Maintainability Values

The greater impact of reliability on O&S costs is attributable to the higher costs associated with acquiring repair and replacement parts. As the reliability decreases the number of failures will increase. This will result in a substantial increase the total cost for consumables and DLR items. Conversely, the actual labor cost makes up a very small amount of the total maintenance cost. Since labor performed by military maintenance personnel is covered indirectly through their annual salary, the only labor costs are for depot level labor and any contract labor that is required. Hence, decreases in maintainability will have a much smaller affect on maintenance costs and O&S costs as a whole. One item to note is that the model did not take into account any possible increases in unit manning if maintainability levels require more maintenance man-hours than currently possible. If this were incorporated, the impact would be realized as an increase in personnel costs.

Figure 18 also indicates that the benefit gained from improving either reliability or maintainability beyond the predicted goals is very small in comparison to the negative impact experienced if the goals are not met. A 30% improvement in reliability above the predicted levels only produces a 5% decrease in O&S costs, while the same improvement in maintainability only produces a 2% decrease in O&S costs. It is very likely that the investment of resources required for growth of this magnitude would be greater than the benefits received.

D. CRITICAL COMPONENT ANALYSIS

In the previous section the analysis indicated that reliability improvements have a greater impact on O&S costs. To provide a specific approach the Comanche PMO can take to improve reliability, the five aircraft systems with the lowest reliabilities and the five aircraft systems with the highest cost per repair were analyzed. If the reliability is improved up to 30% better than predicted reliability levels, every system showed potential of reducing O&S costs to a varying degree. Three systems proved to impact O&S costs significantly, airframe, rotor and the electro-optical sight system (EOSS). The airframe and rotor are the two systems with the lowest reliabilities and the EOSS is the highest cost system to repair. The graphical representation of these results is provided in Figures 19 and 20.

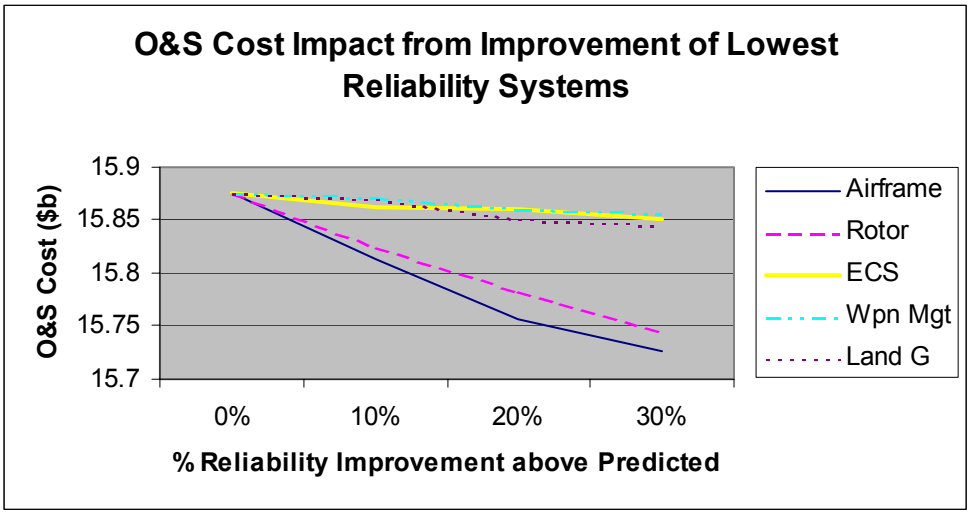


Figure 19 O&S Cost Impact from Improvement of Lowest Reliability Systems

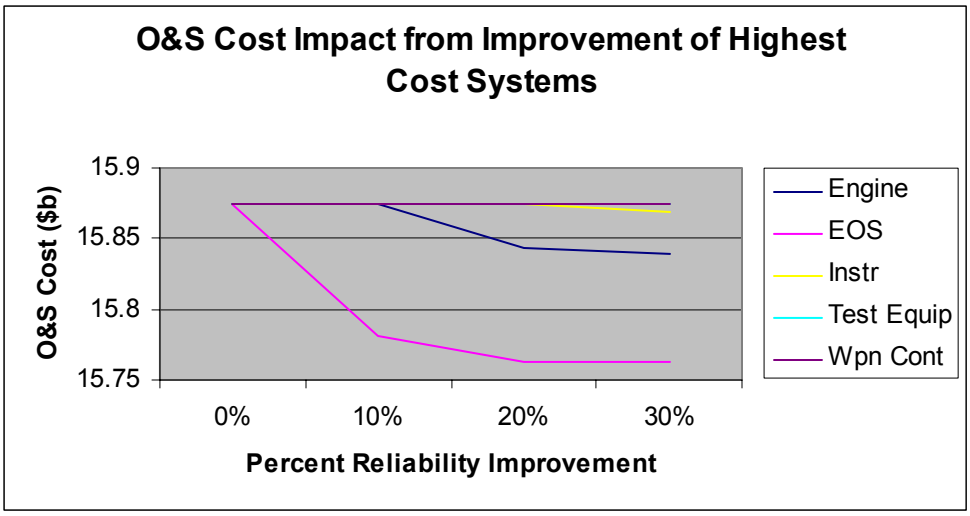


Figure 20 O&S Cost Impact from Reliability Improvement of Highest Cost Systems

This analysis indicates that there is not one specific approach that can be taken to reduce O&S costs the greatest amount. The potential exists to reduce O&S costs with reliability improvement in either type of system, highest cost or lowest reliability. Therefore, the PM must compare the cost to improve the system to the potential O&S cost reductions in deciding which systems to target for reliability improvement.

E. OPERATIONAL AVAILABILITY

A secondary goal of this research was to determine the sensitivity of operational availability with respect to reliability and maintainability. Figures 21, 22 and 23 show the results of increasing and decreasing predicted R&M values 100% for three different scenarios, MTOE aircraft in peacetime, TDA aircraft in peacetime and MTOE aircraft in wartime.

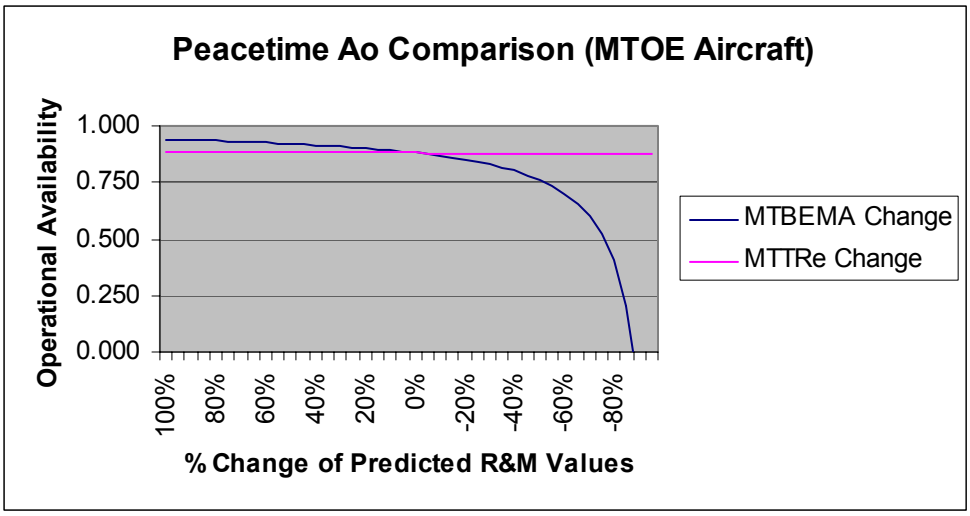


Figure 21 Sensitivity of MTOE Peacetime Operational Availability from Varying MTBEMA and MTTRe values

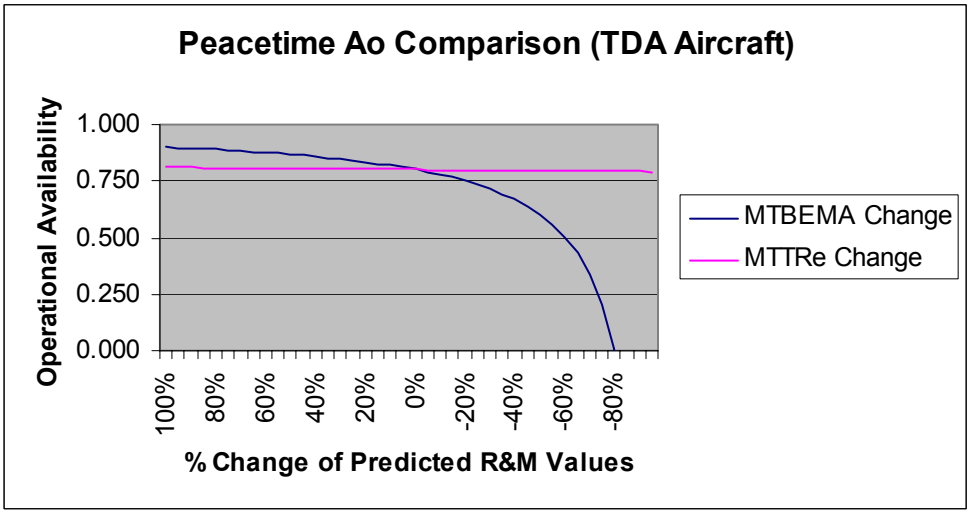


Figure 22 Sensitivity of TDA Peacetime Operational Availability from Varying MTBEMA and MTTRe values

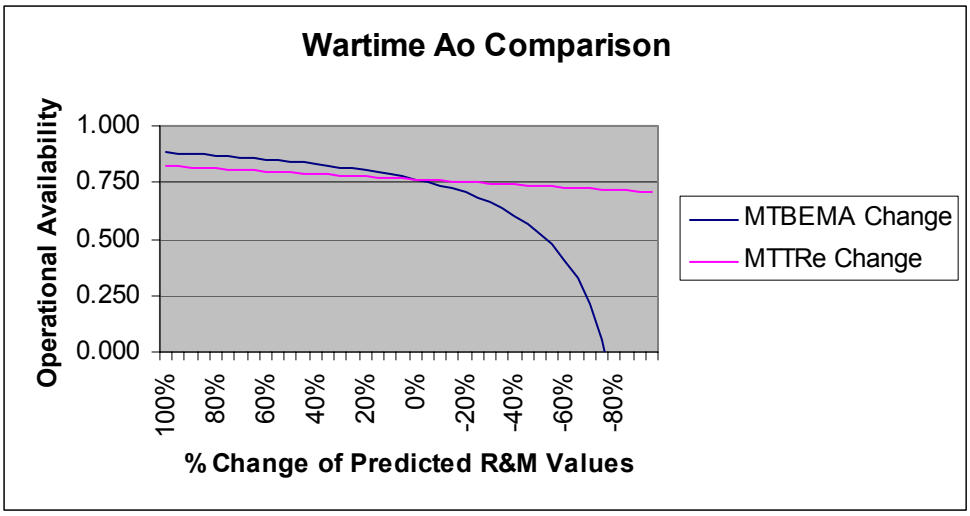


Figure 23 Sensitivity of Wartime Operational Availability from Varying MTBEMA and MTTRe values

Regardless of the type of aircraft, MTOE or TDA, or the operating conditions, peacetime or wartime, the results are the same. Operational availability is more sensitive to changes in reliability. The only difference between the three scenarios is the rate that operational availability decreases when MTBEMA is below predicted levels. The greatest rate occurs during wartime conditions because the impact of decreasing reliability was compounded by the significantly greater amount of flight hours during those conditions. A possible reason why maintainability has little affect on the operational availability is because MTTRe is expressed in hours instead of days or months. This is an exceptional value for MTTRe, and an increase of several hundred percent would have to occur before MTTRe has a significant affect on operational availability.

F. INCREASED FLYING HOURS

The aircraft that are currently in the Army inventory are all experiencing higher O&S costs and lower Ao than were originally projected during procurement. This is partially attributable to lower R&M than were predicted, but another major influence is the over use of the aircraft. The projected flying hours that were the basis of all estimates

in the program office mean little once the system is fielded. The PMO has no control over the utilization of aircraft once fielded, but they are normally held responsible when O&S costs exceed projected levels.

The O&S cost and Ao estimates for the Comanche are based on monthly flying hour levels of 18 and 30 hours respectively for MTOE and TDA aircraft. Through analysis it was determined that for each additional flight hour the fleet averages over the program office monthly flying hour there is a 1.35% increase in O&S costs. This will occur even if the predicted reliability and maintainability goals are met. Figure 24 shows the impact of increased flying hours on O&S costs for a range of 1 to 12 hours above the projected monthly flying hour levels.

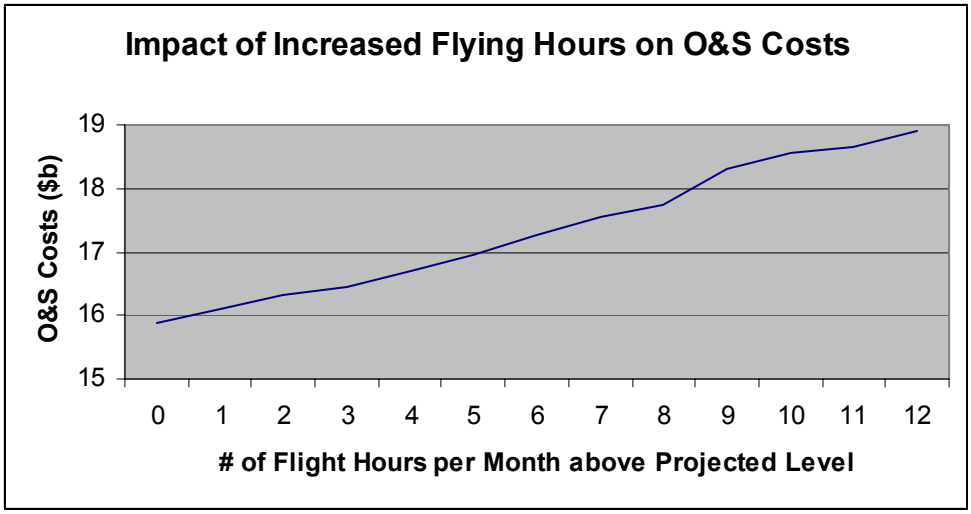


Figure 24 Impact of Increased Flying Hours on O&S Costs

In addition to the increase in O&S costs, there is also a decrease in operational availability if projected flying hour levels are exceeded. For each additional hour the fleet averages per month above projected levels, there is a corresponding decrease in Ao of approximately .8% even if reliability and maintainability goals are met. This could very easily become a critical issue because TDA aircraft only need an increase of approximately 12 flying hours above projected before Ao drops below 70%. Figure 25 shows the consequences of an increase in flying hours with respect to Ao.

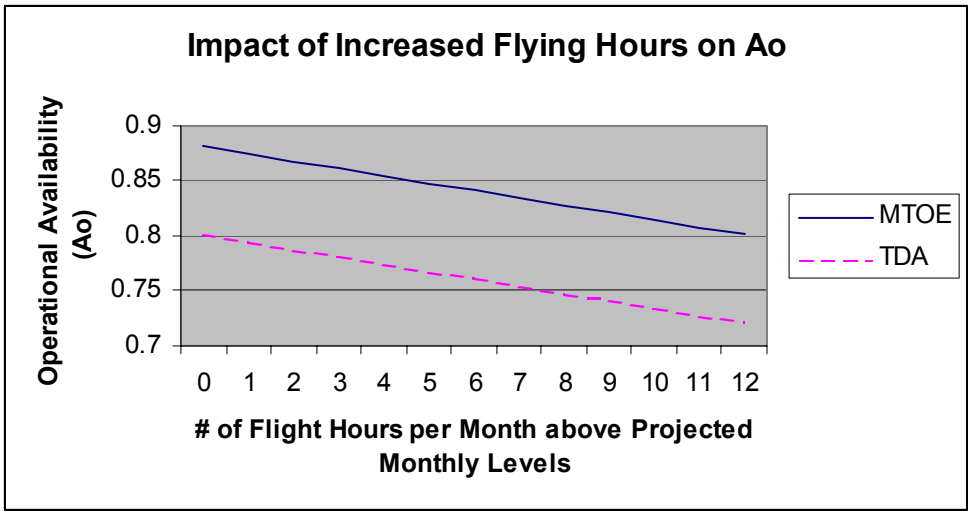


Figure 25 Impact of Increased Flying Hours on Ao

G. RECAPITALIZATION

The currently planned useable life for the Comanche is 20 years. Though, it is highly unlikely the military will dispose of the system in that time frame. Because of decreasing procurement budgets, systems are being kept in service well beyond their originally planned useful life. With this in mind, analysis was conducted on the best time to conduct recapitalization of the aircraft to extend its service life. The time frames included in this analysis were the 18th through the 21st year of service for the aircraft. These years were chosen because the 18th year marks the beginning of the wear out region on the bathtub curve. At this point reliability will begin to decrease due to physical wear on components. The 21st year of service was chosen as the outer limit on the range because this is the year that the aircraft is scheduled for extraction from service. The results of the numerical analysis are shown in Figure 24.

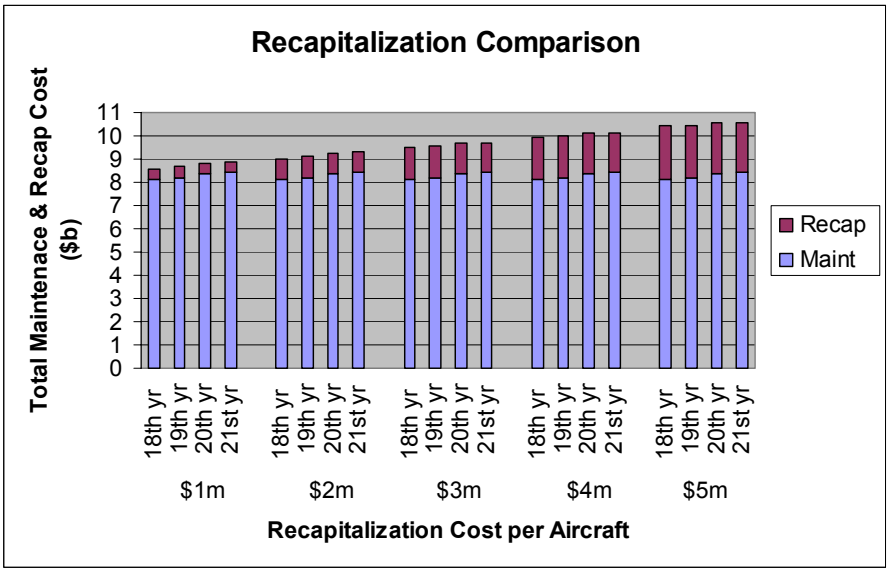


Figure 26 Comparison of Comanche Maintenance Costs with Recapitalization

For an additional twenty years of service available as a result of recapitalization, the maintenance costs range from $8.05 billion to $8.3 billion. This indicates that an additional cost of only $250 million is incurred by recapitalizing aircraft in the 21st year vice the 18th year. By conducting the recapitalization in the 21st year, the aircraft would have a total life of 40 years instead of 37 if completed in the 18th year. The cost for the actual recapitalization will vary depending on the cost per aircraft, but the further out this is completed, the less the cost will be when discounted back to current year dollars. Hence, the most benefit is received through additional service years and minimal additional cost by conducting recapitalization in the 21st year.

H. CHAPTER OVERVIEW

This chapter has discussed the impact of reliability and maintainability with respect to O&S costs and Ao for the Comanche helicopter. The resulting trend from the analysis was O&S costs and Ao are more sensitive to decreasing levels of reliability than to maintainability. The next chapter will conclude this body of research by addressing each of the research questions and present areas for further research uncovered during this endeavor.

V. CONCLUSIONS AND RECOMMENDATIONS

A. CHAPTER OVERVIEW

The objective of this research effort was to determine the impact that reliability and maintainability have on the O&S costs and Ao of the Comanche helicopter. This was accomplished through construction of a cost estimation model using Microsoft Excel software and then varying reliability and maintainability values within the model to determine sensitivity. This chapter provides the conclusions and recommendations resulting from this analysis.

B. CONCLUSIONS

The results of the analysis indicate that failure to obtain the predicted reliability values has a much greater impact on O&S costs and Ao than failing to meet predicted maintainability levels. The Comanche program office has already implemented several initiatives to improve both reliability and maintainability such as the FRACAS program. If resources become scarce or the program experiences another budget cut, continuation of these efforts should be focused on reliability improvement as long as the cost to improve the reliability is less than the projected decrease in O&S costs that will occur.

The emphasis on reliability and maintainability was present from the start in the Comanche program. The many program restructurings and funding cuts have severely weakened the program's chance of meeting the ambitious reliability and maintainability goals though. The restructurings have pushed many activities closer to the fielding date, leading to the fielding of aircraft with technology that is not fully mature. To counter this, the program office must maintain a proactive approach towards reliability improvement in order to meet the predicted goals.

Although the dollar values resulting from this model do not correlate exactly to the predictions from the Comanche program office, they are consistent with the historical percentage breakdown of the O&S cost elements. Therefore, with only minor

modifications and current data, this model can be a useful tool to obtain a clearer understanding of the affect that different variables will have on O&S costs and Ao.

C. ANSWERS TO RESEARCH QUESTIONS

Subsidiary Question #1. What action is the Comanche program office currently taking to improve system reliability and maintainability?

In Chapter II the initiatives of the program office were described in detail. The primary initiative indicated in this research was the placement of emphasis on development of a reliable and maintainable aircraft from the start. Since the beginning of the program military aircraft maintainers have been involved in developing and evaluating aircraft design elements. Also, the FRACAS initiative has aided in improving reliability throughout the life of the program through immediate identification and fixing of aircraft reliability problems. These initiatives along with many others have helped the program maintain a steady rate of improvement throughout many turbulent years.

Subsidiary Question #2. What is the impact of not meeting required reliability and maintainability goals in regard to O&S costs and Ao?

The failure to meet predicted reliability levels will have a much more severe impact on O&S costs and Ao than the failure to meet predicted Maintainability goals. Missing predicted MTBUMA goals by just one percent could result in an increase in O&S costs of over $75 million. Although a failure in reaching MTTR goals has a smaller impact, it could still result in an increase of over $12 million for each percent below predicted levels.

The impact of reliability on Ao is not as great as that on O&S costs. For each 5% MTBEMA is below the predicted level of 4.78 flight hours for peacetime operations, the Ao of the Comanche decreases by 1%. During wartime operations, a MTBEMA 20% less than predicted values would cause the Ao to decrease below the Department of the Army required operation availability level of 70%. Decreases in MTTRe have only a minor impact on Ao for the Comanche. A 5% decrease in MTTRe, reduces Ao by only .01%.

Subsidiary Question #3. How is BIT equipment being utilized in the RAH-66 Comanche to improve reliability and maintainability?

BIT technology is an element of primary importance to the Comanche program. One of the major reasons the reliability and maintainability goals were set high is because of the incorporation of BIT equipment. The BIT and diagnostic equipment in conjunction with the portable diagnostic computer will provide the operator and maintainer with real time systems status information. If accurate, the BIT technology will allow operators to take action before malfunctions occur and also cut down the time required to isolate and identify malfunctions when they do occur. Accurate data will also allow the aircraft engineers to see trends in the aircraft systems to effect improvements quicker than experienced with previous aircraft. Therefore, development of BIT technology has been critical in the reliability and maintainability improvement effort.

Subsidiary Question #4. What are the program goals for reliability and maintainability?

The current program goals for reliability and maintainability of a non-radar equipped aircraft are 1.97 hours for MTBUMA, 4.63 flight hours for MTBEMA, one hour for MTTRe and an 86% operational availability rate. All contractor predictions meet or exceed the required values as specified by the Operational Requirements Document.

Subsidiary Question #5. How are reliability and maintainability measured?

As explained in chapter II, the primary measurements for reliability and maintainability are MTBM and MTTR. For the Comanche, MTBM is split into two measurements, MTBUMA and MTBEMA. MTBUMA is the time between any unscheduled maintenance action and MTBEMA is the time between essential maintenance actions that cause the aircraft to lose operational functionality. MTTR is the mean time to repair the aircraft when an unscheduled maintenance action occurs. This includes the time to physically repair the malfunction as well as the time for fault diagnosis, parts ordering and parts transportation.

There are many other measurements of reliability and maintainability used not only in this program, but in other aircraft programs as well. The choice of measurements used is based on requirements of the program as laid out in the ORD.

Subsidiary Question #6. What are the critical systems where reliability improvement will produce the greatest impact on O&S costs or Ao?

The systems with the lowest reliabilities and those with the highest cost have potential to reduce O&S costs to some degree if their reliabilities are improved. Three individual systems stood out from the others in reducing O&S costs to a greater degree, airframe, rotor and EOSS. The airframe and rotor systems currently have the lowest reliabilities of any of the aircraft systems and the electro-optical sight system has the highest cost for repair of any system.

Subsidiary Question #7. If the 20 year service life needs to be extended, when is it best to conduct recapitalization of aircraft?

In Chapter IV the recapitalization analysis indicates it is best to recapitalize aircraft after the 20th year of service is complete. The maintenance cost for conducting recapitalization at this point is approximately $1.5 billion more than if done in the 18th year, but an additional four years of service is gained by waiting until the 21st year.

Subsidiary Question #8. What is the impact on O&S costs and Ao if the flying hour rate is higher than projected?

Many assumptions are made with respect to the required flying hours when an aircraft is under development. When the assumptions are inaccurate and the actual flying hours exceed the projected, there are serious consequences with respect to O&S costs and Ao. The Comanche program can expect and increase in O&S costs of approximately 1.35% for every hour the fleet averages over the projected levels. In addition, Ao will decrease by .8% for each additional hour.

Primary Research Question. How can the RAH-66 Comanche Program Office best allocate resources to obtain the lowest operation and support costs and greater operational availability in a resource-constrained environment?

The program office should place their effort on improving reliability to at least obtain the levels predicted. The benefits of improving reliability beyond the predicted level are not great, but the negative impact on O&S costs and Ao is severe if predicted levels are not reached.

Although not as great of an impact, maintainability also will negatively affect O&S costs and Ao. If the predicted reliability level is reached and resources are still available then the program office can shift some focus to maintainability improvement.

D. AREAS OF FURTHER RESEARCH

The modeling of O&S costs for the Comanche helicopter was largely based on projections, predicted data and correlated data from other aircraft such as the AH-64A, AH-64D and OH-58D. The use of this type of data was necessary because the Comanche is still under development. Future research could examine the actual performance and costs incurred to better estimate and analyze the O&S costs and Ao of the Comanche.

The Comanche program office is utilizing contractor logistics support from 2004-2011. Future research could include a comparative analysis between the contractor logistics support and DoD depot maintenance to determine if the CLS should be extended beyond the initial contract.

Another area of possible research is the effect of funding cuts and program restructuring on the Comanche reliability and maintainability program. This thesis only covered what the program office must focus on now, but the program occurrences in the past have certainly had a big affect on the current situation.

E. SUMMARY

This thesis endeavored to analyze the impact of reliability and maintainability on O&S costs and Ao. The analysis indicates that it is never too early to incorporate reliability and maintainability into the design of new systems. If reliability and maintainability are an afterthought in design or less thoroughly funded throughout the life of the aircraft, the PMO will always be behind the power curve in trying to field and maintain a system that provides value to our military forces. Thus, a proactive approach must be taken from the start in an effort to produce systems that are supportable as well as operationally effective.

APPENDIX A: LIST OF ASSIGNED NAMES IN THE MODEL

Assigned Name	Item Represented by Assigned Name	Worksheet
AircraftAttrit	Aircraft peacetime attrition rate	O&M
ALDTPeace	Admin delay time during peacetime	O&M
ALDTWar	Admin delay time during war	O&M
Ammo	Training ammunition cost/aircraft/year	O&M
ATCEnl Week	Weekly AT Course cost for enlisted	Training
ATCNCOWeek	Weekly AT Course cost for NCOs	Training
ATCoffWeek	Weekly AT Course cost for officers	Training
ATCostCO	Total AT Course cost for officers	Training
ATCostEnl	Total AT Course cost for enlisted	Training
ATCostNCO	Total AT Course cost for NCOs	Training
ATEnl	Duration of AT course for enlisted soldiers	Training
ATNCO	Duration of AT course for NCOs	Training
ATOff	Duration of AT course for officers	Training
Cost67CCO	Cost of 67C Course for officers	Training
Cost67CEnl	Cost of 67C Course for enlisted	Training
Cost67CNCO	Cost of 67C Course for NCOs	Training
Cost67CWO	Cost of 67C Course for Warrant officers	Training
Cost68CCO	Cost of 68C Course for officers	Training
Cost68Cenl	Cost of 68C Course for enlisted	Training
Cost68CNCO	Cost of 68C Course for NCOs	Training
Cost68CWO	Cost of 68C Course for Warrant officers	Training
Cost68GCO	Cost of 68G Course for officers	Training
Cost68Genl	Cost of 68G course for enlisted	Training
Cost68GNCO	Cost of 68G Course for NCOs	Training
Cost68GWO	Cost of 68G Course for Warrant officers	Training
CPTSal	Average annual salary of CPT	Personnel
CW2Sal	Average annual salary of CW2	Personnel
CW3Sal	Average annual salary of CW3	Personnel
CW4 Salary	Average annual salary of CW4	Personnel
DC67Cenl	# of 67C enlisted soldiers in Div Cav unit	Training
DC67CNCO	# of 67C NCO's in Div Cav unit	Training
DC68Cenl	# of 68C enlisted soldiers in Div Cav unit	Training
DC68CNCO	# of 68C NCO's in Div Cav unit	Training
DCCPT	# of Captains (O-3) in Div Cav unit	Personnel
DCCW2	# of CW2s in Div Cav unit	Personnel
DCCW3	# of CW3s in Div Cav unit	Personnel
DCCW4	# of CW4s in Div Cav unit	Personnel
DCIPCO	# of Commissioned Officer IPs in Div Cav unit	Training
DCIPWO	# of Warrant Officer IPs in Div Cav unit	Training
DCLT	# of Lieutenants (O-2) in Div Cav unit	Personnel
DCLTC	# of Lieutenant Colonels (O-5) in Div Cav unit	Personnel

Assigned Name	Item Represented by Assigned Name	Worksheet
DCMaintCost	Total Div Cav cost for maintenance personnel	Personnel
DCMAJ	# of Majors (O-4) in Div Cav unit	Personnel
DCMTPCO	# of Commissioned officer MTPs in Div Cav unit	Training
DCMTPWO	# of Warrant Officer MTPs in Div Cav unit	Training
DCOpCost	Total Div Cav cost for operational personnel	Personnel
DCPFC	# of PFCs (E-3) in Div Cav unit	Personnel
DCPilotCO	# of Commissioned Officer pilots in Div Cav unit	Training
DCPilotWO	# of Warrant Officer pilots in Div Cav unit	Personnel
DCSal	Annual salary of all personnel in Div Cav unit	Personnel
DCSFC	# of SFCs (E-7) in Div Cav unit	Personnel
DCSGT	# of SGTs (E-5) in Div Cav unit	Personnel
DCSPC	# of SPC (E-4) in Div Cav unit	Personnel
DCSSG	# of SSG (E-6) in Div Cav unit	Personnel
DCSuppCost	Total Div Cav cost for support personnel	Personnel
DepotLaborCost	Hourly labor rate at depot facility	O&M
DiscRate	Financial discount rate	O&M
EnlAttrit	Attrition rate for enlisted soldiers	O&M
FHOpMonth	Average MTOE aircraft flight hours per month	O&M
FHOpYear	Average MTOE aircraft flight hours per year	O&M
FHTDAMonth	Average TDA aircraft flight hours per month	O&M
FHTDAYear	Average TDA aircraft flight hours per year	O&M
FHWarYear	Annual wartime aircraft flight hours	O&M
HA67Cenl	# of 67C enlisted soldiers in Heavy Attack unit	Training
HA67CNCO	# of 67C NCOs in Heavy Attack unit	Training
HA68Cenl	# of 68C enlisted soldiers in Heavy Attack unit	Training
HA68CNCO	# of 68C NCOs in Heavy Attack unit	Training
HACPT	# of Captains in Heavy Attack unit	Personnel
HACW2	# of CW2s in Heavy Attack unit	Personnel
HACW3	# of CW3s in Heavy Attack unit	Personnel
HACW4	# of CW4s in Heavy Attack unit	Personnel
HAIPCO	# of Commissioned Officer IPs in Hvy Attack unit	Training
HAIPWO	# of Warrant Officer IPs in Heavy Attack unit	Training
HALT	# of Lieutenants (O-2) in Heavy Attack unit	Personnel
HALTC	# of Lieutenant Colonels (O-5) in Hvy Attack unit	Personnel
HAMaintCost	Annual Hvy Atk cost for maintenance personnel	Personnel
HAMAJ	# of Majors (O-4) in Heavy Attack unit	Personnel
HAMTPCO	# of Commissioned officer MTPs in Hvy Atk unit	Training
HAMTPWO	# of Warrant Officer MTPs in Heavy Attack unit	Training
HAOpCost	Annual Hvy Atk cost for operational personnel	Personnel
HAPFC	# of PFCs (E-3) in Heavy Attack unit	Personnel
HAPilotCO	# of Commissioned Officer pilots in Hvy Atk unit	Training
HAPilotWO	# of Warrant Officer pilots in Heavy Attack unit	Training
HASal	Annual salary of all personnel in Heavy Attack unit	Personnel
HASFC	# of SFCs (E-7) in Heavy Attack unit	Personnel

Assigned Name	Item Represented by Assigned Name	Worksheet
HASGT	# of SGTs (E-5) in Heavy Attack unit	Personnel
HASPC	# of SPC (E-4) in Heavy Attack unit	Personnel
HASSG	# of SSG (E-6) in Heavy Attack unit	Personnel
HASuppCost	Annual Hvy Atk cost for support personnel	Personnel
InflateRate	Inflation rate	O&M
IPEnl	Duration of IP course for enlisted soldiers	Training
IPEnlWeek	Weekly IP Course cost for enlisted	Training
IPNCO	Duration of IP course for NCOS	Training
IPNCOWeek	Weekly IP Course cost for NCOs	Training
IPOff	Duration of IP course for officers	Training
IPOffWeek	Weekly IP Course cost for officers	Training
LA67Cenl	# of 67C enlisted soldiers in Light Attack unit	Training
LA67CNCO	# of 67C NCOs in Light Attack unit	Training
LA68Cenl	# of 68C enlisted soldiers in Light Attack unit	Training
LA68CNCO	# of 68C NCOs in Light Attack unit	Training
LACPT	# of Captains in Light Attack unit	Personnel
LACW2	# of CW2s in Light Attack unit	Personnel
LACW3	# of CW3s in Light Attack unit	Personnel
LACW4	# of CW4s in Light Attack unit	Personnel
LAIPCO	# of Commissioned Officer IPs in Lt Attack unit	Training
LAIPWO	# of Warrant Officer IPs in Light Attack unit	Training
LALT	# of Lieutenants (O-2) in Light Attack unit	Personnel
LALTC	# of Lieutenant Colonels (O-5) in Light Attack unit	Personnel
LAMaintCost	Annual Lt Atk cost for maintenance personnel	Personnel
LAMAJ	# of Majors (O-4) in Light Attack unit	Personnel
LAMTPCO	# of Commissioned officer MTPs in Lt Attack unit	Training
LAMTPWO	# of Warrant Officer MTPs in Light Attack unit	Training
LAOpCost	Annual Lt Atk cost for operational personnel	Personnel
LAPFC	# of PFCs (E-3) in Light Attack unit	Personnel
LAPilotCO	# of Commissioned Officer pilots in Lt Atk unit	Training
LAPilotWO	# of Warrant Officer pilots in Light Attack unit	Training
LASal	Annual salary of all personnel in Light Attack unit	Personnel
LASFC	# of SFCs (E-7) in Light Attack unit	Personnel
LASGT	# of SGTs (E-5) in Light Attack unit	Personnel
LASPC	# of SPC (E-4) in Light Attack unit	Personnel
LASSG	# of SSG (E-6) in Light Attack unit	Personnel
LASuppCost	Annual Lt Atk cost for support personnel	Personnel
LTCSal	Average annual salary of LTC	Personnel
LTSal	Average annual salary of LT	Personnel
MaintEnl	Duration of 67C course for enlisted soldiers	Training
MaintEnlWeek	Weekly 67C Course cost for enlisted	Training
MaintNCO	Duration of 67C course for NCOs	Training
MaintNCOWeek	Weekly 67C Course cost for NCOs	Training
MaintOff	Duration of 67C course for officers	Training

Assigned Name	Item Represented by Assigned Name	Worksheet
MaintOffWeek	Weekly 67C Course cost for officers	Training
MAJSal	Average annual salary of MAJ	Personnel
MSGSal	Average annual salary of MSG	Personnel
MTPCostCO	MTP Course cost for officers	Training
MTPCostEnl	MTP Course cost for enlisted	Training
MTPCostNCO	MTP Course cost for NCOs	Training
MTPCostWO	MTP Course cost for warrant officers	Training
MTPEnl	Duration of MTP course for enlisted soldiers	Training
MTPEnlWeek	Weekly MTP Course cost for enlisted	Training
MTPNCO	Duration of MTP course for NCOS	Training
MTPNCOWeek	Weekly MTP Course cost for NCOs	Training
MTPOff	Duration of MTP course for Officers	Training
MTPOffWeek	Weekly MTP Course cost for officers	Training
NCOAttrit	Attrition rate for NCOs	O&M
OffAttrit	Attrition rate for Officers	O&M
PFCSal	Average annual salary for PFC	Personnel
POL	Aircraft POL cost per flight hour	O&M
RAS67Cenl	# of 67C enlisted soldiers in RAS unit	Training
RAS67CNCO	# of 67C NCOs in RAS unit	Training
RAS68Cenl	# of 68C enlisted soldiers in RAS unit	Training
RAS68CNCO	# of 68C NCOs in RAS unit	Training
RASCPT	# of Captains in RAS unit	Personnel
RASCW2	# of CW2s in RAS unit	Personnel
RASCW3	# of CW3s in RAS unit	Personnel
RASCW4	# of CW4s in RAS unit	Personnel
RASIPCO	# of Commissioned Officer IPs in RAS unit	Training
RASIPWO	# of Warrant Officer IPs in RAS unit	Training
RASLT	# of Lieutenants (O-2) in RAS unit	Personnel
RASLTC	# of Lieutenant Colonels (O-5) in RAS unit	Personnel
RASMaintCost	Annual RAS cost for maintenance personnel	Personnel
RASMAJ	# of Majors (O-4) in RAS unit	Personnel
RASMTPCO	# of Commissioned officer MTPs in RAS unit	Training
RASMTPWO	# of Warrant Officer MTPs in RAS unit	Training
RASOpCost	Annual RAS cost for operational personnel	Personnel
RASPFC	# of PFCs (E-3) in RAS unit	Personnel
RASPilotCO	# of Commissioned Officer pilots in RAS unit	Training
RASPilotWO	# of Warrant Officer pilots in RAS unit	Training
RASSal	Annual salary of all personnel in RAS unit	Personnel
RASSFC	# of SFCs (E-7) in RAS unit	Personnel
RASSGT	# of SGTs (E-5) in RAS unit	Personnel
RASSPC	# of SPC (E-4) in RAS unit	Personnel
RASSSG	# of SSG (E-6) in RAS unit	Personnel
RASSuppCost	Annual RAS cost for support personnel	Personnel
Recap	Recapitalization cost per aircraft	O&M

Assigned Name	Item Represented by Assigned Name	Worksheet
RepairEnl	Duration of 68C course for enlisted soldiers	Training
RepairEnlWeek	Weekly 68C Course cost for enlisted	Training
RepairNCO	Duration of 68C course for NCOs	Training
RepairNCOWeek	Weekly 68C Course cost for NCOs	Training
RepairOff	Duration of 68C course for officers	Training
RepairOffWeek	Weekly 68C Course cost for officers	Training
SFCSal	Average annual salary of SFC	Personnel
SGTSal	Average annual salary of SGT	Personnel
SOAR67Cenl	# of 67C enlisted soldiers in SOAR unit	Training
SOAR67CNCO	# of 67C NCOs in SOAR unit	Training
SOAR68Cenl	# of 68C enlisted soldiers in SOAR unit	Training
SOAR68CNCO	# of 68C NCOs in SOAR unit	Training
SOARCPT	# of Captains in SOAR unit	Personnel
SOARCW2	# of CW2s in SOAR unit	Personnel
SOARCW3	# of CW3s in SOAR unit	Personnel
SOARCW4	# of CW4s in SOAR unit	Personnel
SOARIPCO	# of Commissioned Officer IPs in SOAR unit	Training
SOARIPWO	# of Warrant Officer IPs in SOAR unit	Training
SOARLT	# of Lieutenants (O-2) in SOAR unit	Personnel
SOARLTC	# of Lieutenant Colonels (O-5) in SOAR unit	Personnel
SOARMaintCost	Annual SOAR cost for maintenance personnel	Personnel
SOARMAJ	# of Majors (O-4) in SOAR unit	Personnel
SOARMTPCO	# of Commissioned officer MTPs in SOAR unit	Training
SOARMTPWO	# of Warrant Officer MTPs in SOAR unit	Training
SOAROpCost	Annual SOAR cost for operational personnel	Personnel
SOARPFC	# of PFCs (E-3) in SOAR unit	Personnel
SOARPilotCO	# of Commissioned Officer pilots in SOAR unit	Training
SOARPilotWO	# of Warrant Officer pilots in SOAR unit	Training
SOARSal	Annual salary of all personnel in SOAR unit	Personnel
SOARSFC	# of SFCs (E-7) in SOAR unit	Personnel
SOARSGT	# of SGTs (E-5) in SOAR unit	Personnel
SOARSPC	# of SPC (E-4) in SOAR unit	Personnel
SOARSSG	# of SSG (E-6) in SOAR unit	Personnel
SOARSuppCost	Annual SOAR cost for support personnel	Personnel
SPCSal	Average annual salary of SPC	Personnel
SSGSal	Average annual salary of SSG	Personnel
StructEnlWeek	Weekly 68G Course cost for enlisted	Training
StructNCOWeek	Weekly 68G Course cost for NCOs	Training
StructOffWeek	Weekly 68G Course cost for officers	Training
StructureEnl	Duration of 68G Course for enlisted	Training
StructureNCO	Duration of 68G Course for NCOs	Training
StructureOff	Duration of 68G Course for officers	Training
TRAD67Cenl	# of 67C enlisted soldiers in TRADOC unit	Training
TRAD67CNCO	# of 67C NCOs in TRADOC unit	Training

Assigned Name	Item Represented by Assigned Name	Worksheet
TRAD68Cenl	# of 68C enlisted soldiers in TRADOC unit	Training
TRAD68CNCO	# of 68C NCOs in TRADOC unit	Training
TRADCPT	# of Captains in TRADOC unit	Personnel
TRADCW2	# of CW2s in TRADOC unit	Personnel
TRADCW3	# of CW3s in TRADOC unit	Personnel
TRADCW4	# of CW4s in TRADOC unit	Personnel
TRADIPCO	# of Commissioned Officer IPs in TRADOC unit	Training
TRADIPWO	# of Warrant Officer IPs in TRADOC unit	Training
TRADLT	# of Lieutenants (O-2) in TRADOC unit	Personnel
TRADLTC	# of Lieutenant Colonels (O-5) in TRADOC unit	Personnel
TRADMaintCost	Annual TRADOC cost for maintenance personnel	Personnel
TRADMAJ	# of Majors (O-4) in TRADOC unit	Personnel
TRADMTPCO	# of Commissioned officer MTPs in TRADOC unit	Training
TRADMTPWO	# of Warrant Officer MTPs in TRADOC unit	Training
TRADOpCost	Annual TRADOC cost for operational personnel	Personnel
TRADPFC	# of PFCs (E-3) in TRADOC unit	Personnel
TRADPilotCO	# of Commissioned Officer pilots in TRADOC unit	Training
TRADPilotWO	# of Warrant Officer pilots in TRADOC unit	Training
TRADSal	Annual salary of all personnel in TRADOC unit	Personnel
TRADSFC	# of SFCs (E-7) in TRADOC unit	Personnel
TRADSGT	# of SGTs (E-5) in TRADOC unit	Personnel
TRADSPC	# of SPC (E-4) in TRADOC unit	Personnel
TRADSSG	# of SSG (E-6) in TRADOC unit	Personnel
TRADSuppCost	Annual TRADOC cost for support personnel	Personnel
TranspoCost	Cost per shipment to depot	O&M
WarFHMonth	Monthly flight hours per aircraft in wartime	O&M

APPENDIX B: REFERENCE WORKSHEETS AND DECISION SUPPORT WORKSHEETS OF THE COMANCHE MODEL

PERSONNEL (RW)

Total Personnel						
Rank	Lt Attack	Hvy Attack	Div Cav	RAS	SOAR	TDA
Commissioned Officers						
LTC (O-5)	1	1	1	1	1	1
MAJ (O-4)	2	2	2	2	1	1
CPT (O-3)	12	12	15	17	2	2
1LT (O-2)	9	10	13	14	0	0
Total (Per Unit)	24	25	31	34	4	4
Warrant Officers						
CW4	4	3	2	2	30	2
CW3	10	10	7	19	23	9
CW2	32	32	36	63	3	25
Total (Per Unit)	46	45	45	84	56	36
Non Commissioned Officers						
CSM/SGM (E-9)	1	1	1	1	1	1
1SG/MSG (E-8)	6	4	4	6	2	1
SFC (E-7)	12	11	13	8	9	0
SSG (E-6)	16	17	15	17	13	0
SGT (E-5)	23	36	39	33	36	0
Total (Per Unit)	58	69	72	65	61	2
Enlisted						
SPC (E-4)	55	53	46	69	18	0
PFC (E-3)	46	44	37	39	7	0
Total (Per Unit)	101	97	83	108	25	0
Unit Total	229	236	231	291	146	42

Operation Personnel						
Rank	Lt Attack	Hvy Attack	Div Cav	RAS	SOAR	TDA
Commissioned Officers						
LTC (O-5)	1	1	1	1	1	0
MAJ (O-4)	2	2	1	2	1	0
CPT (O-3)	3	8	4	6	2	2
1LT (O-2)	8	9	6	12	0	0
Total (Per Unit)	14	20	12	21	4	2
Warrant Officers						
CW4	2	2	2	2	30	2
CW3	9	9	6	18	22	9
CW2	24	24	28	54	0	25
Total (Per Unit)	35	35	36	74	52	36
Non Commissioned Officers						
CSM/SGM (E-9)	0	0	0	0	0	0
1SG/MSG (E-8)	0	0	0	0	0	0
SFC (E-7)	0	0	0	0	0	0
SSG (E-6)	0	0	0	0	0	0
SGT (E-5)	0	0	0	0	0	0
Total (Per Unit)	0	0	0	0	0	0
Enlisted						
SPC (E-4)	0	0	0	0	0	0
PFC (E-3)	0	0	0	0	0	0
Total (Per Unit)	0	0	0	0	0	0
Unit Total	49	55	48	95	56	38

Maintenance Personnel						
Rank	Lt Attack	Hvy Attack	Div Cav	RAS	SOAR	TDA
Commissioned Officers						
LTC (O-5)	0	0	0	0	0	0
MAJ (O-4)	0	0	0	0	0	0
CPT (O-3)	1	1	1	1	0	0
1LT (O-2)	0	0	0	0	0	0
Total (Per Unit)	1	1	1	1	0	0
Warrant Officers						
CW4	0	1	0	0	0	0
CW3	1	1	1	1	1	0
CW2	7	7	7	8	2	0
Total (Per Unit)	8	9	8	9	3	0
Non Commissioned Officers						
CSM/SGM (E-9)	0	0	0	0	0	0
1SG/MSG (E-8)	0	0	1	2	1	0
SFC (E-7)	8	5	7	2	5	0
SSG (E-6)	7	5	9	6	8	0
SGT (E-5)	8	11	18	14	20	0
Total (Per Unit)	23	21	35	24	34	0
Enlisted						
SPC (E-4)	28	19	19	14	4	0
PFC (E-3)	21	12	25	4	0	0
Total (Per Unit)	49	31	44	18	4	0
Unit Total	81	62	88	52	41	0

Support Personnel						
Rank	Lt Attack	Hvy Attack	Div Cav	RAS	SOAR	TDA
Commissioned Officers						
LTC (O-5)	0	0	0	0	0	1
MAJ (O-4)	0	0	1	0	0	1
CPT (O-3)	8	3	10	10	0	0
1LT (O-2)	1	1	7	2	0	0
Total (Per Unit)	9	4	18	12	0	2
Warrant Officers						
CW4	2	0	0	0	0	0
CW3	0	0	0	0	0	0
CW2	1	1	1	1	1	0
Total (Per Unit)	3	1	1	1	1	0
Non Commissioned Officers						
CSM/SGM (E-9)	1	1	1	1	1	1
1SG/MSG (E-8)	6	4	3	4	1	1
SFC (E-7)	4	6	6	6	4	0
SSG (E-6)	9	12	6	11	5	0
SGT (E-5)	15	25	21	19	16	0
Total (Per Unit)	35	48	37	41	27	2
Enlisted						
SPC (E-4)	27	34	27	55	14	0
PFC (E-3)	25	32	12	35	7	0
Total (Per Unit)	52	66	39	90	21	0
Unit Total	99	119	95	144	49	4

Salary Data	
Commissioned Officers	
LTC	$118,424
MAJ	$100,486
CPT	$79,342
1LT	$62,339
Warrant Officers	
CW4	$89,271
CW3	$79,758
CW2	$67,115
Non Commisioned Officers	
CSM/SGM	$77,207
1SG/MSG	$66,280
SFC	$56,865
SSG	$48,821
SGT	$40,729
Enlisted	
SPC	$34,190
PFC	$28,670

Salary Increase	
% Inc/Yr	0.5%

TRAINING (RW)

	A	B	C	D	E	F	G
1		Unit Specialty Requirements/Unit					
2	Specialty	Lt Attack	Hvy Attack	Div Cav	RAS	SOAR	TRADOC
3	Pilot (CO)	20	21	13	22	4	2
4	Pilot (WO)	43	43	43	70	33	31
5	Instructor Pilot (CO)	0	0	0	0	0	1
6	Instructor Pilot (WO)	9	3	8	11	3	31
7	Maintenance Pilot (CO)	1	1	1	1	1	0
8	Maintenance Pilot (WO)	8	8	7	8	2	0
9	Maintainer (67C) (NCO)	24	13	24	31	22	0
10	Maintainer (67C) (Enl)	41	16	26	52	0	0
11	System Repairer (68C) (NCO)	8	6	11	18	12	0
12	System Repairer (68C) (Enl)	14	7	17	28	2	0
13	Structure Repairer (68G) (NCO)	2	3	2	5	2	0
14	Structure Repairer (68G) (Enl)	3	2	5	8	1	0
15							

		Cost/Week		
16				
17		Officer	NCO	Enl
18	Aircraft Transition Course	$ 3,000	$ -	$ -
19	Maint Test Pilot Course	$ 2,500	$ -	$ -
20	Instructor Pilot Course	$ 2,500	$ -	$ -
21	Maintainer School (67C)	$ -	$ 1,700	$ 1,500
22	Repairer School (68C)	$ -	$ 1,100	$ 900
23	Structure Repair School (68G)	$ -	$ 1,700	$ 1,500
24				

		Weeks Required		
25				
26		Officer	NCO	Enlisted
27	Aircraft Transition	10	0	0
28	Maintenance Test Pilot Course	10	0	0
29	Instructor Pilot Course	10	0	0
30	Comanche Maintainer (67C)	0	9	9
31	Comanche System Repairer (68C)	0	26	26
32	Structure Repair (68G)	0	13	13

O&M (RW)

	A	B	C	D	E	F	G	H
1	**General Inputs**					**Unit Specific Inputs**		
2								
3	Discount Rate	3.2%				Light Attack Battalion		
4	Inflation Rate	4%				Total # of Battalions	4	
5	Personnel Retention Rate (Off/NCO/Enl)	70%	80%	60%		# of Aircraft / Bn	24	
6	Aircraft Attrition Rate (Peacetime)	0.25%				# of Flight Co's / Bn	3	
7	Useable Life of System (years)	20				# of Maint Co's / Bn	1	
8						Heavy Attack Battalion		
9	**Maintenance Inputs**					Total # of Battalions	29	
10						# of Aircraft / Bn	9	
11	Recapitalization Cost per Aircraft	$ 2,000,000				# of Flight Co's / Bn	1	
12	ALDT (Peacetime hours)	22				# of Maint Co's / Bn	1	
13	ALDT (Wartime hours)	3.4				Division Cavalry Squadron (Div Cav)		
14	Transportation Cost / Shipment	$ 150				Total # of Squadrons	16	
15	D Level Labor Cost / hour	$ 400				# of Aircraft / Sqdn	24	
16	Surcharge	34.0%				# of Flight Troops / Sqdn	2	
17	DLR Credit Rate	66%				# of Maint Troops / Sqdn	1	
18						Regimental Aviation Squadron (RAS)		
19	**Operational Inputs**					Total # of Squadrons	5	
20						# of Aircraft / Sqdn	42	
21	POL Costs/Flt Hour	$ 95				# of Flight Troops / Sqdn	3	
22	Training Ammunition Cost/Aircraft/Year	$ 60,000				# of Maint Troops / Sqdn	1	
23						Special Operations Aviation Regiment (SOAR)		
24	Peacetime	Month	Year			Total # of SOAR Units	1	
25	Flying Hours/AC (Operational)	18	216			# of Aircraft / SOAR	16	
26	Flying Hours/AC (TDA)	30	360			# of Flight Co's / Unit	1	
27						# of Maint Co's / Unit	1	
28						TDA Unit		
29	Wartime	Month	Year			Total # of TDA Units	1	
30	Flying Hours/AC (Operational)	183	2196			# of Aircraft / Unit	78	
31						# of Flight Co's / Unit	1	
32						# of Maint Co's / Unit	0	

RELIABILITY & MAINTAINABILITY (RW)

	A	B	C	D	E	F	G	H	I	J	K	L
3			Reliability Input									
4	System	Component Name	MTBUMA		MTBF-INH		MTB-IND	MTB-ND	MTBEMA		MTBMAF	
5			Allocated	Predicted	Allocated	Predicted			Allocated	Predicted	Allocated	Predicted
6	Air Vehicle	Airframe	10.6	9.7	15.3	14.3	40.7	120.4	40.3	38.2	135.7	150.9
7		Landing Gear	36.5	36.3	54.4	53.2	300.6	183.2	79.5	80.6	170.1	220.1
8		Flight Controls	164.5	166.3	292.7	273.0	1991.6	639.4	350.6	365.8	680.9	860.1
9		Drive System	43.4	41.5	61.1	57.2	382.9	251.4	81.0	75.6	122.4	140.0
10		T800 Engine	167.0	159.3	246.0	234.6	2067.2	652.8	263.0	250.9	527.5	503.1
11		Secondary Power System	42.0	42.9	69.1	61.1	214.3	440.7	92.0	99.7	167.2	267.2
12		Engine Interface	65.2	99.8	77.3	113.7	1025.9	1886.2	191.1	262.7	969.5	1382.7
13		Rotor	28.9	23.9	44.9	32.1	144.6	259.6	57.6	47.9	272.9	267.4
14		Environmental Control System	32.6	36.3	45.7	43.0	451.4	474.0	120.4	76.4	272.8	440.7
15		Electrical	26.6	38.1	35.4	51.3	385.3	242.3	54.4	78.7	87.0	152.7
16		Pneudraulics	68.2	63.8	105.1	98.8	272.7	538.7	148.7	142.1	279.9	354.9
17		Fuel	257.1	254.8	377.0	340.8	1557.5	2876.2	604.9	618.9	1540.6	1787.1
18		Utility	105.2	93.9	126.8	119.8	1286.3	659.1	286.7	264.3	443.8	532.1
19		Weapons Control System	2397.4	803.9	2570.4	597.1	80767.9	7301.3	1673.4	1416.8	2770.4	2752.9
20		KITS	206.1	283.1	208.9	349.8	5445.4	24993.6	766.3	856.5	2444.8	15205.1
21		**Total Air Vehicle**	3.01	3.02	4.30	4.18	18.47	26.58	7.67	7.50	17.28	22.64
22												
23	Armament	Weapons Control System	200.0	225.0	425.0	806.0	6000.0	407.1	720.0	800.0	1520.0	1503.0
24		Weapons	34.9	36.4	57.3	59.6	181.6	193.3	107.9	91.2	155.7	186.3
25		KITS	51.9	95.6	96.1	156.9	591.5	325.0	150.5	260.7	271.5	545.0
26		**Total Armament**	18.90	23.60	33.10	41.00	135.80	93.40	57.80	62.30	92.90	127.10
27												
28	Flight Controls	Flight Controls	10000.0	8000.0	9000.0	5000.0	12000.0	10000.0	5000.0	6000.0	12000.0	13000.0
29		Engine Interface	639.5	485.0	1100.0	730.2	7650.2	3493.0	1150.0	1157.5	2500.0	2700.0
30		Pneudraulics	538.1	355.5	945.0	690.2	3625.1	895.2	826.5	800.0	1845.3	2084.3
31		Instrument System	320.8	285.1	352.7	340.9	3857.0	3178.5	645.1	563.2	880.2	985.1
32		Flight Reference System	1065.7	9498.5	1950.2	10968.5	571428.6	80906.1	1720.4	11527.4	5451.3	11534.0
33		Integrated Guidance/Flight Control	144.6	216.7	316.0	450.1	6312.6	447.5	248.7	355.1	517.0	1214.5
34		**Total Flight Controls**	69.00	75.60	116.40	121.00	1099.70	246.00	118.60	143.70	233.70	350.60
35												
36	Mission Equipment Package	In-Flight Test Equipment	1556.5	2094.6	3067.4	3498.5	5306.9	317005.4	4330.0	6556.7	0.0	0.0
37		Audio Distribution System	386.4	229.7	440.6	266.0	4995.0	2538.3	414.5	249.4	508.2	369.1
38		Comm/Nav/IFF Integration	56.4	139.5	69.8	171.7	1096.6	2328.2	214.3	290.8	321.9	571.4
39		Radar Navigation System	1744.1	1090.6	2624.3	1278.8	9269.8	36934.4	7838.0	2199.0	8628.6	2545.8
40		Electro-Optical Site System	44.0	53.9	84.0	127.0	127.7	349.6	70.0	59.8	92.0	139.2
41		Aircraft Survivability Equipment	96.2	128.5	218.9	150.7	1225.5	3007.1	106.8	232.3	359.5	359.5
42		Radar	63.5	58.7	63.5	66.6	591.4	2957.2	102.7	104.0	163.8	180.2
43		Weapons Management System	28.3	35.7	53.4	64.8	539.2	93.1	52.5	72.3	75.0	120.6
44		KITS	1440.0	830.0	3775.0	1125.0	23500.0	20150.0	40000.0	2600.0	24000.0	3100.0
45		**Total MEP**	9.40	11.70	14.60	17.70	73.30	65.90	16.70	18.90	26.10	34.50
46												
47		**Total Aircraft**	1.98	2.12	2.94	3.05	13.15	14.80	4.63	4.78	8.99	11.92

RELIABILITY & MAINTAINABILITY (RW) cont.

	A	B	C	D	E	F	G	H	I	J	K	L
50	Maintainability Input											
51	System	Component Name	MTTR	MTTR-REP	MTTR-REM	MaxTTR	MMH/FH/FH		MTTRe		MTTRe-REP	MTTRe-REM
52							Allocated	Predicted	Allocated	Predicted		
53	Air Vehicle	Airframe	4.84	6.14	2.13	6.61	447.04	432.39	2.45	2.55	3.44	1.01
54		Landing Gear	1.68	1.36	2.16	2.01	67.99	60.49	0.98	1.03	0.81	1.22
55		Flight Controls	1.75	8.00	2.35	1.73	12.60	9.95	1.15	1.30	0.85	1.84
56		Drive System	1.73	1.43	2.67	2.05	55.35	53.27	0.99	1.07	0.91	1.43
57		T800 Engine	1.49	0.70	1.90	1.74	13.11	13.57	0.91	0.91	0.00	1.07
58		Secondary Power System	2.85	2.50	3.22	3.33	68.41	72.01	1.09	1.46	1.31	1.62
59		Engine Interface	2.40	8.00	2.57	2.53	31.20	23.37	1.03	1.30	1.12	1.81
60		Rotor	2.45	1.88	3.89	3.08	130.17	147.11	1.38	1.55	1.26	2.07
61		Environmental Control System	1.20	1.11	1.36	1.47	40.42	34.61	0.68	0.70	1.10	0.68
62		Electrical	1.58	1.60	1.84	1.91	60.87	45.88	0.95	1.14	0.95	1.26
63		Pneudraulics	2.20	7.00	3.13	2.39	54.84	44.49	1.14	1.30	1.02	1.64
64		Fuel	2.20	1.38	3.86	2.57	10.21	9.14	1.25	1.40	0.85	2.32
65		Utility	0.79	0.93	0.79	1.10	9.71	9.21	0.51	0.62	0.57	0.77
66		Weapons Control System	0.80	4.00	1.05	0.72	1.44	1.72	0.35	0.40	0.52	0.61
67		KITS	1.70	5.00	0.95	2.06	24.87	36.12	0.76	1.50	1.40	0.54
68		**Total Air Vehicle**	**2.82**	**3.61**	**2.41**	**3.62**	**1028.23**	**993.33**	**1.30**	**1.45**	**1.48**	**1.35**
69												
70	Armament	Weapons Control System	0.78	0.50	1.05	0.72	2.60	1.80	0.20	0.15	0.52	0.61
71		Weapons	1.17	1.13	1.39	1.39	42.83	34.26	0.61	0.67	0.68	0.76
72		KITS	0.75	1.20	0.95	2.06	20.02	10.00	0.52	0.55	1.40	0.54
73		**Total Armament**	**1.03**	**1.08**	**1.25**	**1.49**	**65.45**	**46.06**	**0.54**	**0.60**	**0.84**	**0.70**
74												
75	Flight Controls	Flight Controls	1.30	1.70	2.35	1.73	1.95	3.20	1.40	1.21	0.85	1.84
76		Engine Interface	1.60	2.10	2.57	2.53	4.96	3.05	1.30	1.27	1.12	1.81
77		Pneudraulics	1.40	1.70	3.13	2.39	3.00	5.00	1.30	1.29	1.02	1.64
78		Instrument System	1.63	1.85	1.71	2.18	7.89	7.99	0.82	0.83	1.00	0.89
79		Flight Reference System	1.55	1.30	2.02	1.80	0.24	0.24	0.87	0.85	0.69	1.12
80		Integrated Guidance/Flight Control	0.54	1.00	0.91	0.97	2.08	2.51	0.40	0.36	0.53	0.47
81		**Total Flight Controls**	**1.19**	**1.55**	**1.88**	**1.85**	**20.12**	**21.99**	**0.76**	**0.79**	**0.82**	**0.99**
82												
83	Mission Equipment Package	In-Flight Test Equipment	1.98	0.00	2.00	2.31	0.95	0.95	1.10	1.10	0.00	1.11
84		Audio Distribution System	0.68	0.60	0.73	1.42	2.04	2.94	0.35	0.38	0.33	0.41
85		Comm/Nav/IFF Integration	0.77	0.57	0.84	1.62	15.42	5.22	0.37	0.28	0.06	0.37
86		Radar Navigation System	0.65	0.70	0.65	1.37	0.30	0.60	0.32	0.33	0.37	0.33
87		Electro-Optical Site System	0.95	0.70	1.08	2.00	15.16	17.96	0.49	0.54	0.51	0.60
88		Aircraft Survivability Equipment	0.83	0.73	0.85	1.06	6.66	6.75	0.43	0.43	0.43	0.46
89		Radar	1.28	0.46	1.34	2.69	10.00	30.62	1.01	0.71	0.25	0.74
90		Weapons Management System	0.56	0.83	0.78	0.69	19.31	15.78	0.35	0.40	0.36	0.45
91		KITS	0.00	2.70	0.95	2.06	0.12	0.69	0.75	0.10	1.40	0.54
92		**Total MEP**	**0.84**	**0.71**	**0.97**	**1.56**	**69.96**	**81.51**	**0.51**	**0.49**	**0.38**	**0.54**
93												
94		**Total Aircraft**	**2.25**	**2.80**	**2.03**	**3.00**	**1183.76**	**1142.89**	**1.00**	**1.12**	**1.13**	**1.09**

RELIABILITY & MAINTAINABILITY (RW) cont.

	A	B	C	D	E	F	G	H	I	J	K	L
97	System	Component Name	UMA/KFH		IMH/KFH		IND/KFH	ND/KFH	EMA/KFH		MAF/KFH	
98			Allocated	Predicted	Allocated	Predicted			Allocated	Predicted	Allocated	Predicted
99	Air Vehicle	Airframe	94.340	103.093	65.359	69.930	24.570	8.306	24.814	26.178	7.369	6.627
100		Landing Gear	27.397	27.548	18.382	18.797	3.327	5.459	12.579	12.407	5.879	4.543
101		Flight Controls	6.079	6.013	3.416	3.663	0.502	1.564	2.852	2.734	1.469	1.163
102		Drive System	23.041	24.096	16.367	17.483	2.612	3.978	12.346	13.228	8.170	7.143
103		T800 Engine	5.988	6.277	4.065	4.263	0.484	1.532	3.802	3.986	1.896	1.988
104		Secondary Power System	23.810	23.310	14.472	16.367	4.666	2.269	10.870	10.030	5.961	3.743
105		Engine Interface	15.337	10.020	12.937	8.795	0.975	0.530	5.233	3.807	1.031	0.723
106		Rotor	34.602	41.841	22.272	31.153	6.916	3.852	17.361	20.877	3.664	3.740
107		Environmental Control System	30.675	27.548	21.882	23.256	2.215	2.110	8.306	13.089	3.666	2.269
108		Electrical	37.594	26.247	28.249	19.493	2.595	4.127	18.382	12.706	11.494	6.549
109		Pneudraulics	14.663	15.674	9.515	10.121	3.657	1.856	6.725	7.037	3.573	2.818
110		Fuel	3.890	3.925	2.653	2.934	0.642	0.348	1.653	1.616	0.649	0.560
111		Utility	9.506	10.650	7.886	8.347	0.777	1.517	3.488	3.784	2.253	1.879
112		Weapons Control System	0.417	1.244	0.389	1.675	0.012	0.137	0.598	0.706	0.361	0.363
113		KITS	4.852	3.532	4.787	2.859	0.184	0.040	1.305	1.168	0.409	0.066
114		**Total Air Vehicle**	332.190	331.019	232.630	239.135	54.144	37.624	130.313	133.351	57.864	44.172
115												
116	Armament	Weapons Control System	5.000	4.444	2.353	1.241	0.167	2.456	1.389	1.250	0.658	0.665
117		Weapons	28.653	27.473	17.452	16.779	5.507	5.173	9.268	10.965	6.423	5.368
118		KITS	19.268	10.460	10.406	6.373	1.691	3.077	6.645	3.836	3.683	1.835
119		**Total Armament**	52.921	42.377	30.211	24.393	7.364	10.707	17.301	16.051	10.764	7.868
120												
121	Flight Controls	Flight Controls	0.100	0.125	0.111	0.200	0.083	0.100	0.200	0.167	0.083	0.077
122		Engine Interface	1.564	2.062	0.909	1.369	0.131	0.286	0.870	0.864	0.400	0.370
123		Pneudraulics	1.858	2.813	1.058	1.449	0.276	1.117	1.210	1.250	0.542	0.480
124		Instrument System	3.117	3.508	2.835	2.933	0.259	0.315	1.550	1.776	1.136	1.015
125		Flight Reference System	0.938	0.105	0.513	0.091	0.002	0.012	0.581	0.087	0.183	0.087
126		Integrated Guidance/Flight Control	6.916	4.615	3.165	2.222	0.158	2.235	4.021	2.816	1.934	0.823
127		**Total Flight Controls**	14.493	13.227	8.591	8.265	0.909	4.065	8.432	6.959	4.279	2.852
128												
129	Mission Equipment Package	In-Flight Test Equipment	0.642	0.477	0.326	0.286	0.188	0.003	0.231	0.153	0.000	0.000
130		Audio Distribution System	2.588	4.354	2.270	3.759	0.200	0.394	2.413	4.010	1.968	2.709
131		Comm/Nav/IFF Integration	17.730	7.168	14.327	5.824	0.912	0.430	4.666	3.439	3.107	1.750
132		Radar Navigation System	0.573	0.917	0.381	0.782	0.108	0.027	0.128	0.455	0.116	0.393
133		Electro-Optical Site System	22.727	18.553	11.905	7.874	7.831	2.860	14.286	16.722	10.870	7.184
134		Aircraft Survivability Equipment	10.395	7.782	4.568	6.636	0.816	0.333	9.363	4.305	2.782	2.782
135		Radar	15.748	17.036	15.748	15.015	1.691	0.338	9.737	9.615	6.105	5.549
136		Weapons Management System	35.336	28.011	18.727	15.432	1.855	10.741	19.048	13.831	13.333	8.292
137		KITS	0.694	1.205	0.265	0.889	0.043	0.050	0.025	0.385	0.042	0.323
138		**Total MEP**	106.435	85.503	68.516	56.497	13.643	15.176	59.896	52.914	38.321	28.962
139												
140		**Total Aircraft**	506.040	472.126	339.948	328.289	76.061	67.571	215.942	209.275	111.228	83.874

ADJUSTED RELIABILITY & MAINTAINABILITY (RW)

	A	B	C	D	E	F	G	H	I	J	K	L
2	Reliability Adjustment Factors											
3	MTBUMA Factor		1									
4	MTBEMA Factor		1									
5	MTBMAF Factor		1									
6												
7	Reliability Input											
8			MTBUMA		MTBF-INH				MTBEMA		MTBMAF	
9	System	Component Name	Allocated	Predicted	Allocated	Predicted	MTB-IND	MTB-ND	Allocated	Predicted	Allocated	Predicted
10	Air Vehicle	Airframe	10.6	9.7	15.3	14.3	40.7	120.4	40.3	38.2	135.7	150.9
11		Landing Gear	36.5	36.3	54.4	53.2	300.6	183.2	79.5	80.6	170.1	220.1
12		Flight Controls	164.5	166.3	283.5	258.9	1708.1	601.0	350.6	365.8	680.9	860.1
13		Drive System	43.4	41.5	61.1	57.2	382.9	251.4	81.0	75.6	122.4	140.0
14		T800 Engine	167.0	159.3	246.0	234.6	2067.2	652.8	263.0	250.9	527.5	503.1
15		Secondary Power System	42.0	42.9	69.1	61.1	214.3	440.7	92.0	99.7	167.2	267.2
16		Engine Interface	65.2	99.8	72.2	98.4	904.6	1224.8	191.1	262.7	969.5	1382.7
17		Rotor	28.9	23.9	44.9	32.1	144.6	259.6	57.6	47.9	272.9	267.4
18		Environmental Control System	32.6	36.3	45.7	43.0	451.4	474.0	120.4	76.4	272.8	440.7
19		Electrical	26.6	38.1	35.4	51.3	385.3	242.3	54.4	78.7	87.0	152.7
20		Pneudraulics	68.2	63.8	94.6	86.4	253.6	336.3	148.7	142.1	279.9	354.9
21		Fuel	257.1	254.8	377.0	340.8	1557.5	2876.2	604.9	618.9	1540.6	1787.1
22		Utility	105.2	93.9	126.8	119.8	1286.3	659.1	286.7	264.3	443.8	532.1
23		Weapons Control System	2397.4	803.9	364.7	343.0	5585.1	385.6	1673.4	1416.8	2770.4	2752.9
24		KITS	206.1	283.1	64.7	98.8	521.7	315.8	766.3	856.5	2444.8	15205.1
25		Total Air Vehicle	3.01	3.02	4.04	3.99	17.69	22.37	7.67	7.50	17.28	22.64
26												
27	Armament	Weapons Control System	200.0	225.0	364.7	343.0	5585.1	385.6	720.0	800.0	1520.0	1503.0
28		Weapons	34.9	36.4	57.3	59.6	181.6	193.3	107.9	91.2	155.7	186.3
29		KITS	51.9	95.6	64.7	98.8	521.7	315.8	150.5	260.7	271.5	545.0
30		Total Armament	18.90	23.60	28.05	33.54	131.54	91.46	57.80	62.30	92.90	127.10
31												
32	Flight Controls	Flight Controls	10000.0	8000.0	283.5	258.9	1708.1	601.0	5000.0	6000.0	12000.0	13000.0
33		Engine Interface	639.5	485.0	72.2	98.4	904.6	1224.8	1150.0	1157.5	2500.0	2700.0
34		Pneudraulics	538.1	355.5	94.6	86.4	253.6	336.3	826.5	800.0	1845.3	2084.3
35		Instrument System	320.8	285.1	352.7	340.9	3857.0	3178.5	645.1	563.2	880.2	985.1
36		Flight Reference System	1065.7	9498.5	1950.2	10968.5	571428.6	80906.1	1720.4	11527.4	5451.3	11534.0
37		Integrated Guidance/Flight Control	144.6	216.7	316.0	450.1	6312.6	447.5	248.7	355.1	517.0	1214.5
38		Total Flight Controls	69.00	75.60	29.02	32.42	165.19	124.76	118.60	143.70	233.70	350.60
39												
40	Mission Equipment Package	In-Flight Test Equipment	1556.5	2094.6	3067.4	3498.5	5306.9	317005.4	4330.0	6556.7	0.0	0.0
41		Audio Distribution System	386.4	229.7	440.6	266.0	4995.0	2538.3	414.5	249.4	508.2	369.1
42		Comm/Nav/IFF Integration	56.4	139.5	69.8	171.7	1096.6	2328.2	214.3	290.8	321.9	571.4
43		Radar Navigation System	1744.1	1090.6	2624.3	1278.8	9269.8	36934.4	7838.0	2199.0	8628.6	2545.8
44		Electro-Optical Site System	44.0	53.9	84.0	127.0	127.7	349.6	70.0	59.8	92.0	139.2
45		Aircraft Survivability Equipment	96.2	128.5	218.9	150.7	1225.5	3007.1	106.8	232.3	359.5	359.5
46		Radar	63.5	58.7	63.5	66.6	591.4	2957.2	102.7	104.0	163.8	180.2
47		Weapons Management System	28.3	35.7	53.4	64.8	539.2	93.1	52.5	72.3	75.0	120.6
48		KITS	1440.0	830.0	64.7	98.8	521.7	315.8	40000.0	2600.0	24000.0	3100.0
49		Total MEP	9.40	11.70	11.95	15.21	64.44	54.67	16.70	18.90	26.10	34.50
50												
51		Total Aircraft Reliability	1.98	2.12	2.49	2.65	11.67	12.20	4.63	4.78	8.99	11.92

ADJUSTED RELIABILITY & MAINTAINABILITY (RW) cont.

	A	B	C	D	E	F	G	H	I	J	K	L
54	Maintainability Adjustment Factors											
55	MaxTTR Factor		1									
56	MTTRe Factor		1									
57	MTTR-REP Factor		1									
58												
59	Maintainability Input											
60							MMHPKFH		MTTRe			
61	System	Component Name	MTTR	MTTR-REP	MTTR-REM	MaxTTR	Allocated	Predicted	Allocated	Predicted	MTTRe-REP	MTTRe-REM
62	Air Vehicle	Airframe	4.84	6.14	2.13	6.61	447.04	432.39	2.45	2.56	3.44	1.01
63		Landing Gear	1.68	1.36	2.16	2.01	67.99	60.49	0.98	1.03	0.81	1.22
64		Flight Controls	1.75	8.00	2.35	1.73	12.60	9.95	1.15	1.30	0.85	1.84
65		Drive System	1.73	1.43	2.67	2.05	55.35	53.27	0.99	1.07	0.91	1.43
66		T800 Engine	1.49	0.70	1.90	1.74	13.11	13.57	0.91	0.91	0.00	1.07
67		Secondary Power System	2.85	2.50	3.22	3.33	68.41	72.01	1.09	1.46	1.31	1.62
68		Engine Interface	2.40	8.00	2.57	2.53	31.20	23.37	1.03	1.30	1.12	1.81
69		Rotor	2.45	1.88	3.89	3.08	130.17	147.11	1.38	1.56	1.26	2.07
70		Environmental Control System	1.20	1.11	1.36	1.47	40.42	34.61	0.68	0.70	1.10	0.68
71		Electrical	1.58	1.60	1.84	1.91	60.87	45.88	0.95	1.14	0.95	1.26
72		Pneudraulics	2.20	7.00	3.13	2.39	54.84	44.49	1.14	1.30	1.02	1.64
73		Fuel	2.20	1.38	3.86	2.57	10.21	9.14	1.25	1.40	0.85	2.32
74		Utility	0.79	0.93	0.79	1.10	9.71	9.21	0.51	0.62	0.57	0.77
75		Weapons Control System	0.80	4.00	1.05	0.72	1.44	1.72	0.35	0.40	0.52	0.61
76		KITS	1.70	5.00	0.95	2.06	24.87	36.12	0.76	1.50	1.40	0.54
77		Total Air Vehicle	2.82	3.61	2.41	3.62	1028.23	993.33	1.30	1.45	1.48	1.35
78												
79	Armament	Weapons Control System	0.78	0.50	1.05	0.72	2.60	1.80	0.20	0.15	0.52	0.61
80		Weapons	1.17	1.13	1.39	1.39	42.83	34.26	0.61	0.67	0.68	0.76
81		KITS	0.75	1.20	0.95	2.06	20.02	10.00	0.52	0.55	1.40	0.54
82		Total Armament	1.03	1.08	1.25	1.49	65.45	46.06	0.54	0.60	0.84	0.70
83												
84	Flight Controls	Flight Controls	1.30	1.70	2.35	1.73	1.95	3.20	1.40	1.21	0.85	1.84
85		Engine Interface	1.60	2.10	2.57	2.53	4.96	3.05	1.30	1.27	1.12	1.81
86		Pneudraulics	1.40	1.70	3.13	2.39	3.00	5.00	1.30	1.29	1.02	1.64
87		Instrument System	1.63	1.85	1.71	2.18	7.89	7.99	0.82	0.83	1.00	0.89
88		Flight Reference System	1.55	1.30	2.02	1.80	0.24	0.24	0.87	0.85	0.69	1.12
89		Integrated Guidance/Flight Control	0.54	1.00	0.91	0.97	2.08	2.51	0.40	0.36	0.53	0.47
90		Total Flight Controls	1.19	1.55	1.88	1.85	20.12	21.99	0.76	0.79	0.82	0.99
91												
92	Mission Equipment Package	In-Flight Test Equipment	1.98	0.00	2.00	2.31	0.95	0.95	1.10	1.10	0.00	1.11
93		Audio Distribution System	0.68	0.60	0.73	1.42	2.04	2.94	0.35	0.38	0.33	0.41
94		Comm/Nav/IFF Integration	0.77	0.57	0.84	1.62	15.42	5.22	0.37	0.28	0.06	0.37
95		Radar Navigation System	0.65	0.70	0.65	1.37	0.30	0.60	0.32	0.33	0.37	0.33
96		Electro-Optical Site System	0.95	0.70	1.08	2.00	15.16	17.96	0.49	0.54	0.51	0.60
97		Aircraft Survivability Equipment	0.83	0.73	0.85	1.06	6.66	6.75	0.43	0.43	0.43	0.46
98		Radar	1.28	0.46	1.34	2.69	10.00	30.62	1.01	0.71	0.25	0.74
99		Weapons Management System	0.56	0.83	0.78	0.69	19.31	15.78	0.35	0.40	0.36	0.45
100		KITS	0.00	2.70	0.95	2.06	0.12	0.69	0.75	0.10	1.40	0.54
101		Total MEP	0.84	0.71	0.97	1.56	69.96	81.51	0.51	0.49	0.38	0.54
102												
103		Total Aircraft	2.25	2.80	2.03	3.00	1183.76	1142.89	1.00	1.12	1.13	1.09

PERSONNEL (DSW)

	A	B	C	D	E	F	G	H
4			Light Attack			Heavy Attack		
5	Rank	SALARY	Operation	Maintenance	Support	Operation	Maintenance	Support
6	LTC (O-5)	$ 118,424	$ 118,424	$ -	$ -	$ 118,424	$ -	$ -
7	MAJ (O-4)	$ 100,486	$ 200,972	$ -	$ -	$ 200,972	$ -	$ -
8	CPT (O-3)	$ 79,342	$ 238,026	$ 79,342	$ 634,736	$ 634,736	$ 79,342	$ 238,026
9	1LT (O-2)	$ 62,339	$ 498,712	$ -	$ 62,339	$ 561,051	$ -	$ 118,424
10	CW4 (W4)	$ 89,271	$ 178,542	$ -	$ 178,542	$ 178,542	$ 89,271	$ -
11	CW3 (W3)	$ 79,758	$ 717,822	$ 79,758	$ -	$ 717,822	$ 79,758	$ -
12	CW2 (W2)	$ 67,115	$ 1,610,760	$ 469,805	$ 67,115	$ 1,610,760	$ 469,805	$ 67,115
13	CSM/SGM (E-9)	$ 77,207	$ -	$ -	$ 77,207	$ -	$ -	$ 77,207
14	1SG/MSG (E-8)	$ 66,280	$ -	$ -	$ 397,680	$ -	$ -	$ 265,120
15	SFC (E-7)	$ 56,865	$ -	$ 454,920	$ 227,460	$ -	$ 284,325	$ 341,190
16	SSG (E-6)	$ 48,821	$ -	$ 341,747	$ 439,389	$ -	$ 244,105	$ 585,852
17	SGT (E-5)	$ 40,729	$ -	$ 325,832	$ 610,935	$ -	$ 448,019	$ 1,018,225
18	SPC (E-4)	$ 34,190	$ -	$ 957,320	$ 923,130	$ -	$ 649,610	$ 1,162,460
19	PFC (E-3)	$ 28,670	$ -	$ 602,070	$ 716,750	$ -	$ 344,040	$ 917,440
20	Total Salary By Category		$ 3,563,258	$ 3,310,794	$ 4,335,283	$ 4,022,307	$ 2,688,275	$ 4,791,059
21								
22	FY Year	2002	2003	2004	2005	2006	2007	2008
23	Year	0	1	2	3	4	5	6
24	Lt Attack Bns "Standing Up"	0	0	0	0	0	0	0
25	Lt Attack Bns "Standing Down"	0	0	0	0	0	0	0
26	Total # of Lt Attack Bns	0	0	0	0	0	0	0
27	Hvy Attack Bns "Standing Up"	0	0	0	0	0	0	0
28	Hvy Attack Bns "Standing Down"	0	0	0	0	0	0	0
29	Total # of Hvy Attack Bn's	0	0	0	0	0	0	0
30	Div Cav Sqdns "Standing Up"	0	0	0	0	1	0	0
31	Div Cav Sqdns "Standing Down"	0	0	0	0	0	0	0
32	Total # of Div Cav Sqdns	0	0	0	0	1	1	1
33	Reg Avn Sqdns "Standing Up"	0	0	0	0	0	1	1
34	Reg Avn Sqdns "Standing Down"	0	0	0	0	0	0	0
35	Total # of Reg Avn Sqdns	0	0	0	0	0	1	2
36	SOAR Bns "Standing Up"	0	0	0	0	0	0	0
37	SOAR Bns "Standing Down"	0	0	0	0	0	0	0
38	Total # of SOAR Bns	0	0	0	0	0	0	0
39	TRADOC Bns "Standing Up"	0	0	0	0	1	0	0
40	TRADOC Bns "Standing Down"	0	0	0	0	0	0	0
41	Total # of TRADOC Bns	0	0	0	0	1	1	1
42								
43								
44	Operation Personnel	$ -	$ -	$ -	$ -	$ 6,647,357	$ 13,633,757	$ 20,689,856
45	Maintenance Personnel	$ -	$ -	$ -	$ -	$ 3,705,300	$ 6,183,181	$ 8,685,748
46	Support Personnel	$ -	$ -	$ -	$ -	$ 4,889,003	$ 10,925,021	$ 17,021,277
47								
48	Total (Constant $)	$ -	$ -	$ -	$ -	$ 15,241,660	$ 30,741,959	$ 46,396,880
49	Inflation (Then Yr $)	$ -	$ -	$ -	$ -	$ 17,830,586	$ 37,402,294	$ 58,706,855
50	PV (FY2002 $)	$ -	$ -	$ -	$ -	$ 13,437,345	$ 26,262,318	$ 38,407,019
51	NPV	$ 7,443,679,135						

PERSONNEL (DSW) cont.

	I	J	K	L	M	N	O	P	Q	R	S	T
4	Divisional Cav			RAS			SOAR			TDA		
5	Operation	Maintenance	Support	Operation	Maintenance	Support	Operation	Maintenance	Support	Operation	Maintenance	Support
6	$ 118,424	$ -	$ -	$ 118,424	$ -	$ -	$ 118,424	$ -	$ -	$ -	$ -	$ 118,424
7	$ 100,486	$ -	$ 100,486	$ 200,972	$ -	$ -	$ 100,486	$ -	$ -	$ -	$ -	$ 100,486
8	$ 317,368	$ 79,342	$ 793,420	$ 476,052	$ 79,342	$ 793,420	$ 158,684	$ -	$ -	$ 158,684	$ -	$ -
9	$ 710,544	$ -	$ 436,373	$ 748,068	$ -	$ 124,678	$ -	$ -	$ -	$ -	$ -	$ -
10	$ 178,542	$ -	$ -	$ 178,542	$ -	$ -	$ 2,678,130	$ -	$ -	$ 178,542	$ -	$ -
11	$ 478,548	$ 79,758	$ -	$ 1,435,644	$ 79,758	$ -	$ 1,754,676	$ 79,758	$ -	$ 717,822	$ -	$ -
12	$ 1,879,220	$ 469,805	$ 67,115	$ 3,624,210	$ 536,920	$ 67,115	$ -	$ 134,230	$ 67,115	$ 1,677,875	$ -	$ -
13	$ -	$ -	$ 77,207	$ -	$ -	$ 77,207	$ -	$ -	$ 77,207	$ -	$ -	$ 77,207
14	$ -	$ 66,280	$ 198,840	$ -	$ 132,560	$ 265,120	$ -	$ 66,280	$ 66,280	$ -	$ -	$ 66,280
15	$ -	$ 398,055	$ 341,190	$ -	$ 113,730	$ 341,190	$ -	$ 284,325	$ 227,460	$ -	$ -	$ -
16	$ -	$ 439,389	$ 292,926	$ -	$ 292,926	$ 537,031	$ -	$ 390,568	$ 244,105	$ -	$ -	$ -
17	$ -	$ 733,122	$ 855,309	$ -	$ 570,206	$ 773,851	$ -	$ 814,580	$ 651,664	$ -	$ -	$ -
18	$ -	$ 649,610	$ 923,130	$ -	$ 478,660	$ 1,880,450	$ -	$ 136,760	$ 478,660	$ -	$ -	$ -
19	$ -	$ 716,750	$ 344,040	$ -	$ 114,680	$ 1,003,450	$ -	$ -	$ 200,690	$ -	$ -	$ -
20	$ 3,783,132	$ 3,632,111	$ 4,430,036	$ 6,781,912	$ 2,398,782	$ 5,863,512	$ 4,810,400	$ 1,906,501	$ 2,013,181	$ 2,732,923	$ -	$ 362,397
21												
22	2009	2010	2011	2012	2013	2014	2015	2016	2017	2018	2019	2020
23	7	8	9	10	11	12	13	14	15	16	17	18
24	0	1	0	0	0	2	0	0	0	0	0	1
25	0	0	0	0	0	0	0	0	0	0	0	0
26	0	1	1	1	1	3	3	3	3	3	3	4
27	0	0	0	0	0	0	1	7	7	5	0	0
28	0	0	0	0	0	0	0	0	0	0	0	0
29	0	0	0	0	0	0	1	8	15	20	20	20
30	0	1	2	2	2	0	0	0	0	1	3	2
31	0	0	0	0	0	0	0	0	0	0	0	0
32	1	2	4	6	8	8	8	8	8	9	12	14
33	0	0	1	0	1	0	1	0	0	0	0	0
34	0	0	0	0	0	0	0	0	0	0	0	0
35	2	2	3	3	4	4	5	5	5	5	5	5
36	1	0	0	0	0	0	0	0	0	0	0	0
37	0	0	0	0	0	0	0	0	0	0	0	0
38	1	1	1	1	1	1	1	1	1	1	1	1
39	0	0	0	0	0	0	0	0	0	0	0	0
40	0	0	0	0	0	0	0	0	0	0	0	0
41	1	1	1	1	1	1	1	1	1	1	1	1
42												
43												
44	$ 25,774,616	$ 33,548,929	$ 48,723,582	$ 56,920,404	$ 72,362,359	$ 80,290,235	$ 92,219,639	$ 122,873,170	$ 153,830,932	$ 180,479,711	$ 193,735,774	$ 206,879,359
45	$ 10,703,414	$ 17,982,461	$ 28,179,012	$ 35,955,622	$ 46,343,357	$ 53,605,067	$ 59,300,912	$ 79,776,275	$ 100,454,910	$ 119,448,984	$ 131,906,741	$ 144,134,590
46	$ 19,191,091	$ 28,409,176	$ 43,950,774	$ 53,483,705	$ 69,305,057	$ 78,856,930	$ 90,619,494	$ 127,035,469	$ 163,813,337	$ 195,375,737	$ 210,818,719	$ 226,307,593
47												
48	$ 55,669,121	$ 79,940,566	$ 120,853,368	$ 146,359,731	$ 188,010,773	$ 212,752,232	$ 242,140,045	$ 329,684,914	$ 418,099,179	$ 495,304,432	$ 536,461,234	$ 577,321,543
49	$ 73,256,766	$ 109,404,184	$ 172,012,027	$ 216,648,156	$ 289,433,948	$ 340,623,177	$ 403,180,974	$ 570,907,601	$ 752,973,000	$ 927,695,913	$ 1,044,973,103	$1,169,547,516
50	$ 44,653,601	$ 62,134,047	$ 91,020,975	$ 106,813,127	$ 132,955,426	$ 145,786,650	$ 160,779,456	$ 212,120,828	$ 260,665,680	$ 299,224,436	$ 314,038,931	$ 327,478,816

PERSONNEL (DSW) cont.

	U	V	W	X	Y	Z	AA	AB	AC	AD	AE	AF
22	2021	2022	2023	2024	2025	2026	2027	2028	2029	2030	2031	2032
23	19	20	21	22	23	24	25	26	27	28	29	30
24	0	0	0	0	0	0	0	0	0	0	0	0
25	0	0	0	0	0	0	0	0	0	1	0	0
26	4	4	4	4	4	4	4	4	4	4	3	3
27	0	5	4	0	0	0	0	0	0	0	0	0
28	0	0	0	0	0	0	0	0	0	0	0	0
29	20	25	29	29	29	29	29	29	29	29	29	29
30	2	0	0	0	0	0	0	0	0	0	0	0
31	0	0	0	0	0	0	1	0	0	1	1	3
32	16	16	16	16	16	16	16	15	15	15	14	13
33	0	0	0	0	0	0	0	0	0	0	0	0
34	0	0	0	0	0	0	0	1	1	0	1	0
35	5	5	5	5	5	5	5	5	4	3	3	2
36	0	0	0	0	0	0	0	0	0	0	0	0
37	0	0	0	0	0	0	0	0	1	0	0	0
38	1	1	1	1	1	1	1	1	1	0	0	0
39	0	0	0	0	0	0	0	0	0	0	0	0
40	0	0	0	0	0	0	0	0	0	0	0	0
41	1	1	1	1	1	1	1	1	1	1	1	1
42												
43												
44	$ 216,232,096	$ 239,534,403	$ 258,597,876	$ 259,890,865	$ 261,190,320	$ 262,496,271	$ 263,808,753	$ 260,820,854	$ 254,365,421	$ 242,307,566	$ 235,029,454	$ 223,934,358
45	$ 152,841,539	$ 168,457,062	$ 181,239,805	$ 182,146,004	$ 183,056,735	$ 183,972,018	$ 184,891,878	$ 181,681,326	$ 179,845,162	$ 175,793,861	$ 168,649,456	$ 162,488,424
46	$ 237,179,882	$ 264,833,880	$ 287,438,402	$ 288,875,594	$ 290,319,972	$ 291,771,572	$ 293,230,430	$ 289,653,165	$ 284,392,683	$ 276,757,452	$ 268,011,845	$ 257,396,976
47												
48	$ 606,253,516	$ 672,825,345	$ 727,276,083	$ 730,912,464	$ 734,567,026	$ 738,239,861	$ 741,931,060	$ 732,155,345	$ 718,603,265	$ 694,858,879	$ 671,690,755	$ 643,819,759
49	$1,277,284,721	$1,474,243,185	$1,657,293,516	$1,732,203,183	$1,810,498,766	###########	$1,977,866,776	$2,029,878,571	$2,071,998,074	$ 2,083,675,627	$ 2,094,769,348	$2,088,163,402
50	$ 333,226,876	$ 358,350,815	$ 375,340,703	$ 365,520,742	$ 355,957,700	$ 346,644,853	$ 337,575,656	$ 322,798,202	$ 306,999,282	$ 287,650,470	$ 269,437,568	$ 250,249,594

	AG	AH	AI	AJ	AK	AL	AM	AN	AO	AP	AQ	AR
22	2033	2034	2035	2036	2037	2038	2039	2040	2041	2042	2043	2044
23	31	32	33	34	35	36	37	38	39	40	41	42
24	0	0	0	0	0	0	0	0	0	0	0	0
25	0	1	1	0	0	0	0	1	0	0	0	0
26	3	3	2	1	1	1	1	1	0	0	0	0
27	0	0	0	0	0	0	0	0	0	0	0	0
28	0	0	1	7	7	5	0	0	0	5	4	0
29	29	29	29	28	21	14	9	9	9	9	4	0
30	0	0	0	0	0	0	0	0	0	0	0	0
31	2	0	0	0	0	1	2	2	3	0	0	0
32	10	8	8	8	8	8	7	5	3	0	0	0
33	0	0	0	0	0	0	0	0	0	0	0	0
34	0	1	1	0	0	0	0	0	0	0	0	0
35	2	2	1	0	0	0	0	0	0	0	0	0
36	0	0	0	0	0	0	0	0	0	0	0	0
37	0	0	0	0	0	0	0	0	0	0	0	0
38	0	0	0	0	0	0	0	0	0	0	0	0
39	0	0	0	0	0	0	0	0	0	0	0	0
40	0	0	0	0	0	0	0	0	0	0	0	1
41	1	1	1	1	1	1	1	1	1	1	1	1
42												
43												
44	$ 211,806,935	$ 203,990,415	$ 192,814,360	$ 176,755,804	$ 144,113,299	$ 111,139,951	$ 82,958,396	$ 74,228,017	$ 61,079,897	$ 47,530,019	$ 23,092,863	$ 3,369,783
45	$ 150,582,589	$ 142,814,257	$ 136,797,261	$ 127,531,449	$ 105,762,097	$ 83,771,863	$ 63,657,057	$ 55,195,242	$ 42,625,529	$ 29,536,476	$ 13,192,959	$ -
46	$ 243,171,653	$ 233,994,265	$ 223,140,792	$ 206,496,473	$ 167,595,056	$ 128,299,463	$ 94,802,946	$ 84,567,994	$ 68,962,164	$ 53,082,487	$ 23,957,191	$ 446,847
47												
48	$ 605,561,177	$ 580,798,937	$ 552,752,413	$ 510,783,727	$ 417,470,453	$ 323,211,277	$ 241,418,400	$ 213,991,253	$ 172,667,589	$ 130,148,982	$ 60,243,013	$ 3,816,631
49	$ 2,042,638,637	$ 2,037,476,790	$2,016,651,455	$1,938,075,041	$ 1,647,375,559	$ 1,326,437,280	$1,030,395,422	$ 949,867,253	$ 797,096,786	$ 624,847,948	$ 300,797,088	$ 19,818,939
50	$ 228,080,107	$ 211,970,537	$ 195,479,238	$ 175,035,986	$ 138,623,333	$ 103,996,184	$ 75,269,939	$ 64,649,850	$ 50,547,843	$ 36,919,251	$ 16,559,190	$ 1,016,560

TRAINING (DSW)

	A	B	C	D	E	F	G	H	I
4	**Training Cost (Individual)**	**Aircraft Transition**	**IP Course**	**Maint Pilot Course**	**Maintainer School (67C)**	**Repairer School (68C)**	**Structure Repair School (68G)**		
5	Commissioned Officer	$ 30,000.00	$ 25,000.00	$ 25,000.00	$ -	$ -	$ -		
6	Warrant Officer	$ 30,000.00	$ 25,000.00	$ 25,000.00	$ -	$ -	$ -		
7	NCO	$ -	$ -	$ -	$ 15,300.00	$ 28,600.00	$ 22,100		
8	Enlisted	$ -	$ -	$ -	$ 13,500.00	$ 23,400.00	$ 19,500		
9									
10	**FY Year**	**2002**	**2003**	**2004**	**2005**	**2006**	**2007**	**2008**	**2009**
11	**Year**	**0**	**1**	**2**	**3**	**4**	**5**	**6**	**7**
12	**Lt Attack Bns "Standing Up"**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**
13	**Lt Attack Bns "Standing Down"**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**
14	**Total # of Lt Attack Bns**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**
15	**Hvy Attack Bns "Standing Up"**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**
16	**Hvy Attack Bns "Standing Down"**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**
17	**Total # of Hvy Attack Bn's**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**
18	**Div Cav Sqdns "Standing Up"**	**0**	**0**	**0**	**0**	**1**	**0**	**0**	**0**
19	**Div Cav Sqdns "Standing Down"**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**
20	**Total # of Div Cav Sqdns**	**0**	**0**	**0**	**0**	**1**	**1**	**1**	**1**
21	**Reg Avn Sqdns "Standing Up"**	**0**	**0**	**0**	**0**	**0**	**1**	**1**	**0**
22	**Reg Avn Sqdns "Standing Down"**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**
23	**Total # of Reg Avn Sqdns**	**0**	**0**	**0**	**0**	**0**	**1**	**2**	**2**
24	**SOAR Bns "Standing Up"**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**1**
25	**SOAR Bns "Standing Down"**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**
26	**Total # of SOAR Bns**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**1**
27	**TRADOC Bns "Standing Up"**	**0**	**0**	**0**	**0**	**1**	**0**	**0**	**0**
28	**TRADOC Bns "Standing Down"**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**
29	**Total # of TRADOC Bns**	**0**	**0**	**0**	**0**	**1**	**1**	**1**	**1**
30									
31	**Personnel Requiring Training**								
32									
33	**Aicraft Transition Course**								
34	**Commissioned Officer**	0	0	0	15	27	34	22	52
35	**Warrant Officer**	0	0	0	74	93	114	98	161
36	**Instructor Pilot Course**								
37	**Commissioned Officer**	0	0	0	1	1	1	1	1
38	**Warrant Officer**	0	0	0	39	23	26	22	37
39	**Maintenance Test Pilot Course**								
40	**Commissioned Officer**	0	0	0	1	2	2	2	4
41	**Warrant Officer**	0	0	0	7	11	13	9	23
42	**Maintainer School (67C)**								
43	**NCO**	0	0	0	24	36	42	40	70
44	**Enlisted**	0	0	0	26	63	84	52	119
45	**Repairer School (68C)**								
46	**NCO**	0	0	0	11	21	24	22	31
47	**Enlisted**	0	0	0	17	35	46	32	61
48	**Structure Repair School (68G)**								
49	**NCO**	0	0	0	2	6	7	5	7
50	**Enlisted**	0	0	0	5	10	14	10	17
51									
52									
53	**Funds Required For Training**								
54									
55	**Aicraft Transition Course**								
56	**Commissioned Officer**	$ -	$ -	$ -	$ 450,000	$ 810,000	$ 1,020,000	$ 660,000	$ 1,560,000
57	**Warrant Officer**	$ -	$ -	$ -	$ 2,220,000	$ 2,790,000	$ 3,420,000	$ 2,940,000	$ 4,830,000
58	**Instructor Pilot Course**								
59	**Commissioned Officer**	$ -	$ -	$ -	$ 25,000	$ 25,000	$ 25,000	$ 25,000	$ 25,000
60	**Warrant Officer**	$ -	$ -	$ -	$ 975,000	$ 575,000	$ 650,000	$ 550,000	$ 925,000
61	**Maintenance Test Pilot Course**								
62	**Commissioned Officer**	$ -	$ -	$ -	$ 25,000	$ 50,000	$ 50,000	$ 50,000	$ 100,000
63	**Warrant Officer**	$ -	$ -	$ -	$ 175,000	$ 275,000	$ 325,000	$ 225,000	$ 575,000
64	**Maintainer School (67C)**								
65	**NCO**	$ -	$ -	$ -	$ 367,200	$ 550,800	$ 642,600	$ 612,000	$ 1,071,000
66	**Enlisted**	$ -	$ -	$ -	$ 351,000	$ 850,500	$ 1,134,000	$ 702,000	$ 1,606,500
67	**Repairer School (68C)**								
68	**NCO**	$ -	$ -	$ -	$ 314,600	$ 600,600	$ 686,400	$ 629,200	$ 886,600
69	**Enlisted**	$ -	$ -	$ -	$ 397,800	$ 819,000	$ 1,076,400	$ 748,800	$ 1,427,400
70	**Structure Repair School (68G)**								
71	**NCO**	$ -	$ -	$ -	$ 44,200	$ 132,600	$ 154,700	$ 110,500	$ 154,700
72	**Enlisted**	$ -	$ -	$ -	$ 97,500	$ 195,000	$ 273,000	$ 195,000	$ 331,500
73									
74	**Total (Constant $)**	$ -	$ -	$ -	$ 5,442,300	$ 7,673,500	$ 9,457,100	$ 7,447,500	$ 13,492,700
75	**Inflation (Then Yr $)**	$ -	$ -	$ -	$ 6,121,847	$ 8,976,910	$ 11,506,008	$ 9,423,463	$ 17,755,473

TRAINING (DSW) cont.

	J	K	L	M	N	O	P	Q	R	S	T	U
10	**2010**	**2011**	**2012**	**2013**	**2014**	**2015**	**2016**	**2017**	**2018**	**2019**	**2020**	**2021**
11	**8**	**9**	**10**	**11**	**12**	**13**	**14**	**15**	**16**	**17**	**18**	**19**
12	**1**	**0**	**0**	**0**	**2**	**0**	**0**	**0**	**0**	**0**	**1**	**0**
13	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**
14	**1**	**1**	**1**	**1**	**3**	**3**	**3**	**3**	**3**	**3**	**4**	**4**
15	**0**	**0**	**0**	**0**	**0**	**1**	**7**	**7**	**5**	**0**	**0**	**0**
16	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**
17	**0**	**0**	**0**	**0**	**0**	**1**	**8**	**15**	**20**	**20**	**20**	**20**
18	**1**	**2**	**2**	**2**	**0**	**0**	**0**	**0**	**1**	**3**	**2**	**2**
19	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**
20	**2**	**4**	**6**	**8**	**8**	**8**	**8**	**8**	**9**	**12**	**14**	**16**
21	**0**	**1**	**0**	**1**	**0**	**1**	**0**	**0**	**0**	**0**	**0**	**0**
22	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**
23	**2**	**3**	**3**	**4**	**4**	**5**	**5**	**5**	**5**	**5**	**5**	**5**
24	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**
25	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**
26	**1**	**1**	**1**	**1**	**1**	**1**	**1**	**1**	**1**	**1**	**1**	**1**
27	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**
28	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**
29	**1**	**1**	**1**	**1**	**1**	**1**	**1**	**1**	**1**	**1**	**1**	**1**
30												
31												
32												
33												
34	77	70	99	106	121	238	282	297	253	272	266	353
35	256	233	329	306	359	580	671	718	666	705	701	856
36												
37	1	1	1	1	1	1	1	1	1	1	1	1
38	52	49	65	64	65	76	83	91	99	107	106	109
39												
40	5	5	7	7	7	13	15	16	15	16	16	19
41	34	33	45	46	51	95	112	120	108	115	114	144
42												
43	111	95	136	121	126	182	200	217	217	232	222	249
44	183	173	246	265	284	355	400	439	453	499	496	544
45												
46	56	46	68	52	64	86	95	102	102	106	104	116
47	105	102	143	134	152	180	200	222	242	260	265	279
48												
49	13	10	16	12	17	32	36	36	29	30	29	41
50	30	30	42	37	43	51	57	63	69	73	76	80
51												
52												
53												
54												
55												
56	$ 2,310,000	$ 2,100,000	$ 2,970,000	$ 3,180,000	$ 3,630,000	$ 7,140,000	$ 8,460,000	$ 8,910,000	$ 7,590,000	$ 8,160,000	$ 7,980,000	$ 10,590,000
57	$ 7,680,000	$ 6,990,000	$ 9,870,000	$ 9,180,000	$ 10,770,000	$ 17,400,000	$ 20,130,000	$ 21,540,000	$ 19,980,000	$ 21,150,000	$ 21,030,000	$ 25,680,000
58												
59	$ 25,000	$ 25,000	$ 25,000	$ 25,000	$ 25,000	$ 25,000	$ 25,000	$ 25,000	$ 25,000	$ 25,000	$ 25,000	$ 25,000
60	$ 1,300,000	$ 1,225,000	$ 1,625,000	$ 1,600,000	$ 1,625,000	$ 1,900,000	$ 2,075,000	$ 2,275,000	$ 2,475,000	$ 2,675,000	$ 2,650,000	$ 2,725,000
61												
62	$ 125,000	$ 125,000	$ 175,000	$ 175,000	$ 175,000	$ 325,000	$ 375,000	$ 400,000	$ 375,000	$ 400,000	$ 400,000	$ 475,000
63	$ 850,000	$ 825,000	$ 1,125,000	$ 1,150,000	$ 1,275,000	$ 2,375,000	$ 2,800,000	$ 3,000,000	$ 2,700,000	$ 2,875,000	$ 2,850,000	$ 3,600,000
64												
65	$ 1,698,300	$ 1,453,500	$ 2,080,800	$ 1,851,300	$ 1,927,800	$ 2,784,600	$ 3,060,000	$ 3,320,100	$ 3,320,100	$ 3,549,600	$ 3,396,600	$ 3,809,700
66	$ 2,470,500	$ 2,335,500	$ 3,321,000	$ 3,577,500	$ 3,834,000	$ 4,792,500	$ 5,400,000	$ 5,926,500	$ 6,115,500	$ 6,736,500	$ 6,696,000	$ 7,344,000
67												
68	$ 1,601,600	$ 1,315,600	$ 1,944,800	$ 1,487,200	$ 1,830,400	$ 2,459,600	$ 2,717,000	$ 2,917,200	$ 2,917,200	$ 3,031,600	$ 2,974,400	$ 3,317,600
69	$ 2,457,000	$ 2,386,800	$ 3,346,200	$ 3,135,600	$ 3,556,800	$ 4,212,000	$ 4,680,000	$ 5,194,800	$ 5,662,800	$ 6,084,000	$ 6,201,000	$ 6,528,600
70												
71	$ 287,300	$ 221,000	$ 353,600	$ 265,200	$ 375,700	$ 707,200	$ 795,600	$ 795,600	$ 640,900	$ 663,000	$ 640,900	$ 906,100
72	$ 585,000	$ 585,000	$ 819,000	$ 721,500	$ 838,500	$ 994,500	$ 1,111,500	$ 1,228,500	$ 1,345,500	$ 1,423,500	$ 1,482,000	$ 1,560,000
73												
74	$ 21,389,700	$ 19,587,400	$ 27,655,400	$ 26,348,300	$ 29,863,200	$ 45,115,400	$ 51,629,100	$ 55,532,700	$ 53,147,000	$ 56,773,200	$ 56,325,900	$ 66,561,000
75	$ 29,273,281	$ 27,878,978	$ 40,936,748	$ 40,561,997	$ 47,811,945	$ 75,120,457	$ 89,404,896	$ 100,011,255	$ 99,543,334	$ 110,588,544	$ 114,105,938	$ 140,233,988
76	$ 16,625,209	$ 14,752,293	$ 20,182,872	$ 18,632,706	$ 20,463,503	$ 29,956,340	$ 33,218,406	$ 34,622,094	$ 32,107,286	$ 33,234,452	$ 31,950,201	$ 36,585,213

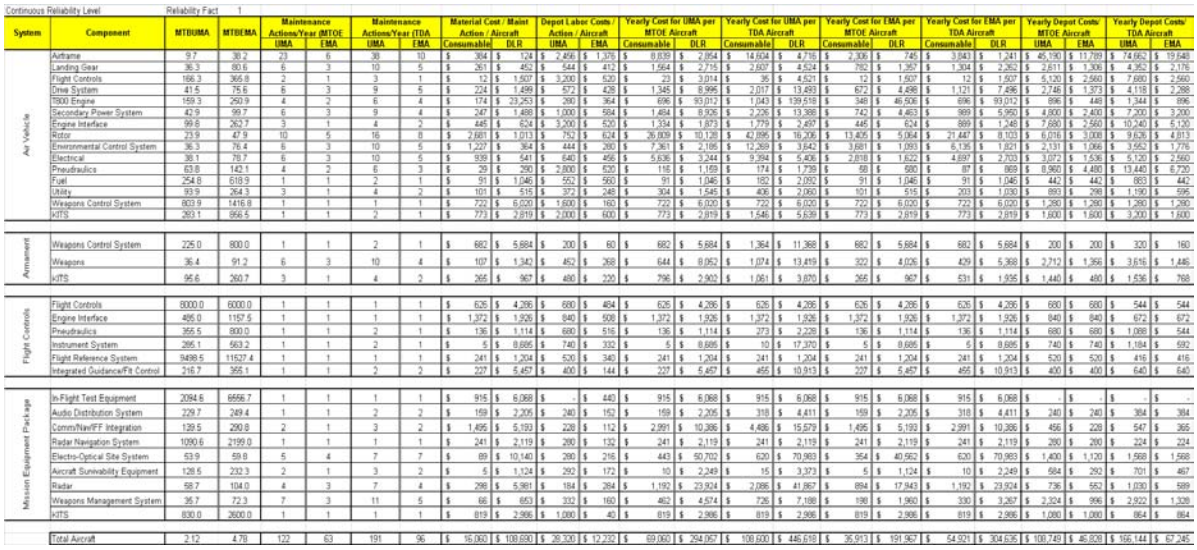
TRAINING (DSW) cont.

	V	W	X	Y	Z	AA	AB	AC	AD	AE	AF
10	**2022**	**2023**	**2024**	**2025**	**2026**	**2027**	**2028**	**2029**	**2030**	**2031**	**2032**
11	**20**	**21**	**22**	**23**	**24**	**25**	**26**	**27**	**28**	**29**	**30**
12	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**
13	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**1**	**0**	**0**
14	**4**	**4**	**4**	**4**	**4**	**4**	**4**	**4**	**4**	**3**	**3**
15	**5**	**4**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**
16	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**
17	**25**	**29**	**29**	**29**	**29**	**29**	**29**	**29**	**29**	**29**	**29**
18	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**
19	**0**	**0**	**0**	**0**	**0**	**1**	**0**	**0**	**1**	**1**	**3**
20	**16**	**16**	**16**	**16**	**16**	**16**	**15**	**15**	**15**	**14**	**13**
21	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**
22	**0**	**0**	**0**	**0**	**0**	**0**	**1**	**1**	**0**	**1**	**0**
23	**5**	**5**	**5**	**5**	**5**	**5**	**5**	**4**	**3**	**3**	**2**
24	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**
25	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**1**	**0**	**0**	**0**
26	**1**	**1**	**1**	**1**	**1**	**1**	**1**	**1**	**0**	**0**	**0**
27	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**
28	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**
29	**1**	**1**	**1**	**1**	**1**	**1**	**1**	**1**	**1**	**1**	**1**
30											
31											
32											
33											
34	363	304	304	304	304	304	300	294	286	276	266
35	877	757	757	757	757	757	744	723	692	666	632
36											
37	1	1	1	1	1	1	1	1	1	1	1
38	111	102	102	102	102	102	100	97	93	87	82
39											
40	20	17	17	17	17	17	17	16	16	15	15
41	148	126	126	126	126	126	124	121	118	114	109
42											
43	249	207	207	207	207	207	202	196	186	176	165
44	560	522	522	522	522	522	512	491	470	443	412
45											
46	116	97	97	97	97	97	95	91	85	82	76
47	286	270	270	270	270	270	263	252	240	227	209
48											
49	41	31	31	31	31	31	31	30	28	28	26
50	82	77	77	77	77	77	75	72	68	65	60
51											
52											
53											
54											
55											
56	$ 10,890,000	$ 9,120,000	$ 9,120,000	$ 9,120,000	$ 9,120,000	$ 9,120,000	$ 9,000,000	$ 8,820,000	$ 8,580,000	$ 8,280,000	$ 7,980,000
57	$ 26,310,000	$ 22,710,000	$ 22,710,000	$ 22,710,000	$ 22,710,000	$ 22,710,000	$ 22,320,000	$ 21,690,000	$ 20,760,000	$ 19,980,000	$ 18,960,000
58											
59	$ 25,000	$ 25,000	$ 25,000	$ 25,000	$ 25,000	$ 25,000	$ 25,000	$ 25,000	$ 25,000	$ 25,000	$ 25,000
60	$ 2,775,000	$ 2,550,000	$ 2,550,000	$ 2,550,000	$ 2,550,000	$ 2,550,000	$ 2,500,000	$ 2,425,000	$ 2,325,000	$ 2,175,000	$ 2,050,000
61											
62	$ 500,000	$ 425,000	$ 425,000	$ 425,000	$ 425,000	$ 425,000	$ 425,000	$ 400,000	$ 400,000	$ 375,000	$ 375,000
63	$ 3,700,000	$ 3,150,000	$ 3,150,000	$ 3,150,000	$ 3,150,000	$ 3,150,000	$ 3,100,000	$ 3,025,000	$ 2,950,000	$ 2,850,000	$ 2,725,000
64											
65	$ 3,809,700	$ 3,167,100	$ 3,167,100	$ 3,167,100	$ 3,167,100	$ 3,167,100	$ 3,090,600	$ 2,998,800	$ 2,845,800	$ 2,692,800	$ 2,524,500
66	$ 7,560,000	$ 7,047,000	$ 7,047,000	$ 7,047,000	$ 7,047,000	$ 7,047,000	$ 6,912,000	$ 6,628,500	$ 6,345,000	$ 5,980,500	$ 5,562,000
67											
68	$ 3,317,600	$ 2,774,200	$ 2,774,200	$ 2,774,200	$ 2,774,200	$ 2,774,200	$ 2,717,000	$ 2,602,600	$ 2,431,000	$ 2,345,200	$ 2,173,600
69	$ 6,692,400	$ 6,318,000	$ 6,318,000	$ 6,318,000	$ 6,318,000	$ 6,318,000	$ 6,154,200	$ 5,896,800	$ 5,616,000	$ 5,311,800	$ 4,890,600
70											
71	$ 906,100	$ 685,100	$ 685,100	$ 685,100	$ 685,100	$ 685,100	$ 685,100	$ 663,000	$ 618,800	$ 618,800	$ 574,600
72	$ 1,599,000	$ 1,501,500	$ 1,501,500	$ 1,501,500	$ 1,501,500	$ 1,501,500	$ 1,462,500	$ 1,404,000	$ 1,326,000	$ 1,267,500	$ 1,170,000
73											
74	$ 68,084,800	$ 59,472,900	$ 59,472,900	$ 59,472,900	$ 59,472,900	$ 59,472,900	$ 58,391,400	$ 56,578,700	$ 54,222,600	$ 51,901,600	$ 49,010,300
75	$ 149,182,181	$ 135,524,945	$ 140,945,943	$ 146,583,781	$ 152,447,132	$ 158,545,018	$ 161,888,392	$ 163,137,246	$ 162,597,491	$ 161,863,000	$ 158,959,885
76	$ 36,262,373	$ 30,693,433	$ 29,741,699	$ 28,819,476	$ 27,925,849	$ 27,059,931	$ 25,744,043	$ 24,171,363	$ 22,446,509	$ 20,819,463	$ 19,050,064

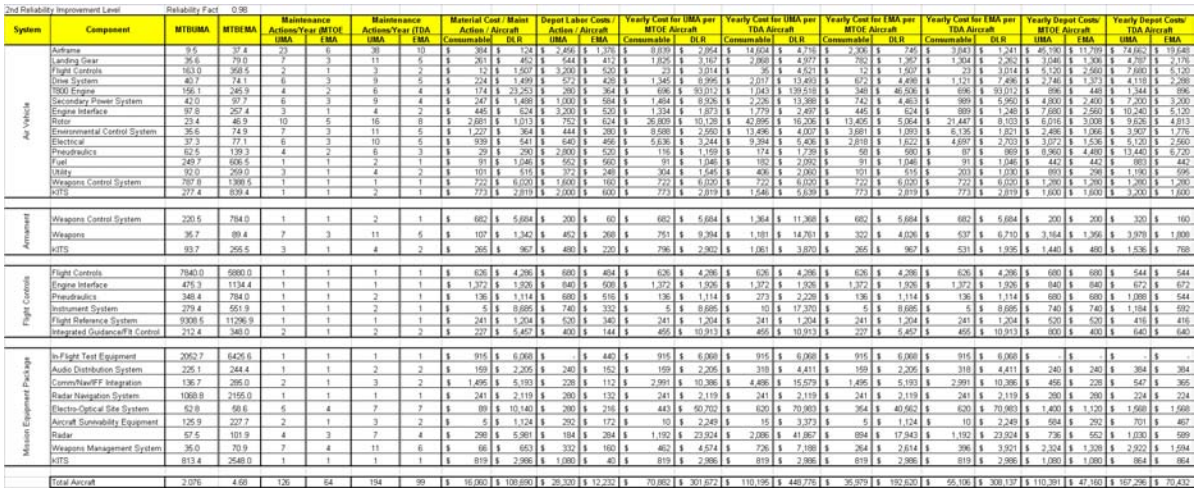
TRAINING (DSW) cont.

	AG	AH	AI	AJ	AK	AL	AM	AN	AO	AP	AQ	AR	AS
10	**2033**	**2034**	**2035**	**2036**	**2037**	**2038**	**2039**	**2040**	**2041**	**2042**	**2043**	**2044**	**2045**
11	**31**	**32**	**33**	**34**	**35**	**36**	**37**	**38**	**39**	**40**	**41**	**42**	**43**
12	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**
13	**0**	**1**	**1**	**0**	**0**	**0**	**0**	**1**	**0**	**0**	**0**	**0**	**0**
14	**3**	**3**	**2**	**1**	**1**	**1**	**1**	**1**	**0**	**0**	**0**	**0**	**0**
15	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**
16	**0**	**0**	**1**	**7**	**7**	**5**	**0**	**0**	**0**	**5**	**4**	**0**	**0**
17	**29**	**29**	**29**	**28**	**21**	**14**	**9**	**9**	**9**	**9**	**4**	**0**	**0**
18	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**
19	**2**	**0**	**0**	**0**	**0**	**1**	**2**	**2**	**3**	**0**	**0**	**0**	**0**
20	**10**	**8**	**8**	**8**	**8**	**8**	**7**	**5**	**3**	**0**	**0**	**0**	**0**
21	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**
22	**0**	**1**	**1**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**
23	**2**	**2**	**1**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**
24	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**
25	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**
26	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**
27	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**
28	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**1**	**1**
29	**1**	**1**	**1**	**1**	**1**	**1**	**1**	**1**	**1**	**1**	**1**	**1**	**0**
30													
31													
32													
33													
34	254	246	234	215	171	126	91	83	69	58	26	1	0
35	594	568	534	487	397	306	229	203	165	126	61	10	0
36													
37	1	1	1	1	1	1	1	1	1	1	1	1	0
38	75	70	64	57	51	44	37	33	25	18	13	10	0
39													
40	14	13	12	12	9	7	6	5	4	3	2	0	0
41	103	99	94	87	70	53	39	35	28	22	10	0	0
42													
43	151	141	130	116	98	80	62	53	38	24	11	0	0
44	381	360	323	279	234	190	147	126	89	58	26	0	0
45													
46	69	65	60	53	45	36	28	24	18	11	5	0	0
47	189	175	158	139	119	100	79	65	46	26	12	0	0
48													
49	25	24	23	21	17	12	9	8	7	6	3	0	0
50	54	50	45	40	34	29	23	19	14	8	4	0	0
51													
52													
53													
54													
55													
56	$ 7,620,000	$ 7,380,000	$ 7,020,000	$ 6,450,000	$ 5,130,000	$ 3,780,000	$ 2,730,000	$ 2,490,000	$ 2,070,000	$ 1,740,000	$ 780,000	$ 30,000	$ -
57	$ 17,820,000	$ 17,040,000	$ 16,020,000	$ 14,610,000	$ 11,910,000	$ 9,180,000	$ 6,870,000	$ 6,090,000	$ 4,950,000	$ 3,780,000	$ 1,830,000	$ 300,000	$ -
58													
59	$ 25,000	$ 25,000	$ 25,000	$ 25,000	$ 25,000	$ 25,000	$ 25,000	$ 25,000	$ 25,000	$ 25,000	$ 25,000	$ 25,000	$ -
60	$ 1,875,000	$ 1,750,000	$ 1,600,000	$ 1,425,000	$ 1,275,000	$ 1,100,000	$ 925,000	$ 825,000	$ 625,000	$ 450,000	$ 325,000	$ 250,000	$ -
61													
62	$ 350,000	$ 325,000	$ 300,000	$ 300,000	$ 225,000	$ 175,000	$ 150,000	$ 125,000	$ 100,000	$ 75,000	$ 50,000	$ -	$ -
63	$ 2,575,000	$ 2,475,000	$ 2,350,000	$ 2,175,000	$ 1,750,000	$ 1,325,000	$ 975,000	$ 875,000	$ 700,000	$ 550,000	$ 250,000	$ -	$ -
64													
65	$ 2,310,300	$ 2,157,300	$ 1,989,000	$ 1,774,800	$ 1,499,400	$ 1,224,000	$ 948,600	$ 810,900	$ 581,400	$ 367,200	$ 168,300	$ -	$ -
66	$ 5,143,500	$ 4,860,000	$ 4,360,500	$ 3,766,500	$ 3,159,000	$ 2,565,000	$ 1,984,500	$ 1,701,000	$ 1,201,500	$ 783,000	$ 351,000	$ -	$ -
67													
68	$ 1,973,400	$ 1,859,000	$ 1,716,000	$ 1,515,800	$ 1,287,000	$ 1,029,600	$ 800,800	$ 686,400	$ 514,800	$ 314,600	$ 143,000	$ -	$ -
69	$ 4,422,600	$ 4,095,000	$ 3,697,200	$ 3,252,600	$ 2,784,600	$ 2,340,000	$ 1,848,600	$ 1,521,000	$ 1,076,400	$ 608,400	$ 280,800	$ -	$ -
70													
71	$ 552,500	$ 530,400	$ 508,300	$ 464,100	$ 375,700	$ 265,200	$ 198,900	$ 176,800	$ 154,700	$ 132,600	$ 66,300	$ -	$ -
72	$ 1,053,000	$ 975,000	$ 877,500	$ 780,000	$ 663,000	$ 565,500	$ 448,500	$ 370,500	$ 273,000	$ 156,000	$ 78,000	$ -	$ -
73													
74	$ 45,720,300	$ 43,471,700	$ 40,463,500	$ 36,538,800	$ 30,083,700	$ 23,574,300	$ 17,904,900	$ 15,696,600	$ 12,271,800	$ 8,981,800	$ 4,347,400	$ 605,000	$ -
75	$ 154,220,671	$ 152,501,277	$ 147,626,269	$ 138,639,766	$ 118,712,957	$ 96,747,337	$ 76,419,722	$ 69,674,279	$ 56,651,120	$ 43,121,807	$ 21,706,835	$ 3,141,634	$ -
76	$ 17,220,210	$ 15,865,593	$ 14,309,796	$ 12,521,160	$ 9,989,456	$ 7,585,247	$ 5,582,428	$ 4,742,170	$ 3,592,527	$ 2,547,860	$ 1,194,984	$ 161,142	$ -

O&M (DSW)



Continuous Reliability Level			Reliability Fact	1																											
System	Component	MTBUMA	MTBEMA	Maintenance Actions/Year (MTOE		Maintenance Actions/Year (TDA		Material Cost / Maint Action / Aircraft			Depot Labor Costs / Action / Aircraft			Yearly Cost for UMA per MTOE Aircraft			Yearly Cost for UMA per TDA Aircraft			Yearly Cost for EMA per MTOE Aircraft			Yearly Cost for EMA per TDA Aircraft			Yearly Depot Costs/ MTOE Aircraft		Yearly Depot Costs/ TDA Aircraft	
				UMA	EMA	UMA	EMA	Consumable	DLR		UMA	EMA		Consumable	DLR		Consumable	DLR		Consumable	DLR		Consumable	DLR		UMA	EMA	UMA	EMA
Air Vehicle	Airframe	9.7	38.2	23	6	38	10	$ 384	$ 124	$	2,456	$ 1,376	$	8,839	$ 2,854	$	14,604	$ 4,715	$	2,306	$ 745	$	3,843	$ 1,241	$	45,190	$ 11,789	$	74,662	$	19,648
	Landing Gear	36.3	80.6	6	3	10	5	$ 261	$ 452	$	544	$ 412	$	1,564	$ 2,715	$	2,607	$ 4,524	$	782	$ 1,357	$	1,304	$ 2,262	$	2,611	$ 1,306	$	4,352	$	2,176
	Flight Controls	166.3	366.8	2	1	3	1	$ 12	$ 1,507	$	3,200	$ 520	$	23	$ 3,014	$	35	$ 4,521	$	12	$ 1,507	$	12	$ 1,507	$	5,120	$ 2,560	$	7,680	$	2,560
	Drive System	41.5	75.6	6	3	9	5	$ 224	$ 1,499	$	572	$ 428	$	1,345	$ 8,995	$	2,017	$ 13,493	$	672	$ 4,498	$	1,121	$ 7,496	$	2,746	$ 1,373	$	4,118	$	2,288
	T800 Engine	159.3	250.9	4	2	6	4	$ 174	$ 23,253	$	280	$ 364	$	696	$ 93,012	$	1,043	$ 139,518	$	348	$ 46,506	$	696	$ 93,012	$	896	$ 448	$	1,344	$	896
	Secondary Power System	42.9	99.7	6	3	9	4	$ 247	$ 1,488	$	1,000	$ 584	$	1,464	$ 8,926	$	2,226	$ 13,388	$	742	$ 4,463	$	969	$ 5,950	$	4,800	$ 2,400	$	7,200	$	3,200
	Engine Interface	99.8	262.7	3	1	4	2	$ 445	$ 624	$	3,200	$ 520	$	1,334	$ 1,873	$	1,779	$ 2,497	$	445	$ 624	$	889	$ 1,248	$	7,680	$ 2,560	$	10,240	$	5,120
	Rotor	23.9	47.9	10	5	16	8	$ 2,681	$ 1,013	$	752	$ 624	$	26,809	$ 10,128	$	42,895	$ 16,206	$	13,405	$ 5,064	$	21,447	$ 8,103	$	6,016	$ 3,008	$	9,626	$	4,813
	Environmental Control System	36.3	76.4	6	3	10	5	$ 1,227	$ 364	$	444	$ 280	$	7,361	$ 2,185	$	12,269	$ 3,642	$	3,681	$ 1,093	$	6,135	$ 1,821	$	2,131	$ 1,066	$	3,552	$	1,776
	Electrical	36.1	78.7	6	3	10	5	$ 939	$ 541	$	640	$ 456	$	5,636	$ 3,244	$	9,394	$ 5,406	$	2,818	$ 1,622	$	4,697	$ 2,703	$	3,072	$ 1,536	$	5,120	$	2,560
	Pneudraulics	63.8	142.1	4	2	6	3	$ 29	$ 290	$	2,800	$ 520	$	116	$ 1,159	$	174	$ 1,739	$	58	$ 580	$	87	$ 869	$	8,960	$ 4,480	$	13,440	$	6,720
	Fuel	254.8	618.9	1	1	2	1	$ 91	$ 1,046	$	552	$ 560	$	91	$ 1,046	$	182	$ 2,092	$	91	$ 1,046	$	91	$ 1,046	$	442	$ 442	$	883	$	442
	Utility	93.9	264.3	3	1	4	2	$ 101	$ 515	$	372	$ 248	$	304	$ 1,545	$	406	$ 2,060	$	101	$ 515	$	203	$ 1,030	$	893	$ 298	$	1,190	$	595
	Weapons Control System	803.9	1416.8	1	1	1	1	$ 722	$ 6,020	$	1,600	$ 160	$	722	$ 6,020	$	722	$ 6,020	$	722	$ 6,020	$	722	$ 6,020	$	1,280	$ 1,280	$	1,280	$	1,280
	KITS	283.1	856.5	1	1	2	1	$ 773	$ 2,819	$	2,000	$ 600	$	773	$ 2,819	$	1,546	$ 5,639	$	773	$ 2,819	$	773	$ 2,819	$	1,600	$ 1,600	$	3,200	$	1,600
Armament	Weapons Control System	225.0	800.0	1	1	2	1	$ 682	$ 5,684	$	200	$ 60	$	682	$ 5,684	$	1,364	$ 11,368	$	682	$ 5,684	$	682	$ 5,684	$	200	$ 200	$	320	$	160
	Weapons	36.4	91.2	6	3	10	4	$ 107	$ 1,342	$	452	$ 268	$	644	$ 8,052	$	1,074	$ 13,419	$	322	$ 4,026	$	429	$ 5,368	$	2,712	$ 1,356	$	3,616	$	1,446
	KITS	95.6	260.7	3	1	4	2	$ 265	$ 967	$	480	$ 220	$	796	$ 2,902	$	1,061	$ 3,870	$	265	$ 967	$	531	$ 1,935	$	1,440	$ 480	$	1,536	$	768
Flight Controls	Flight Controls	8000.0	6000.0	1	1	1	1	$ 626	$ 4,286	$	680	$ 464	$	626	$ 4,286	$	626	$ 4,286	$	626	$ 4,286	$	626	$ 4,286	$	680	$ 680	$	544	$	544
	Engine Interface	485.0	1157.5	1	1	1	1	$ 1,372	$ 1,926	$	840	$ 508	$	1,372	$ 1,926	$	1,372	$ 1,926	$	1,372	$ 1,926	$	1,372	$ 1,926	$	840	$ 840	$	672	$	672
	Pneudraulics	355.5	800.0	1	1	2	1	$ 136	$ 1,114	$	680	$ 516	$	136	$ 1,114	$	273	$ 2,228	$	136	$ 1,114	$	136	$ 1,114	$	680	$ 680	$	1,088	$	544
	Instrument System	285.1	563.2	1	1	2	1	$ 5	$ 8,685	$	740	$ 332	$	5	$ 8,685	$	10	$ 17,370	$	5	$ 8,685	$	5	$ 8,685	$	740	$ 740	$	1,184	$	592
	Flight Reference System	9498.5	11527.4	1	1	1	1	$ 241	$ 1,204	$	520	$ 340	$	241	$ 1,204	$	241	$ 1,204	$	241	$ 1,204	$	241	$ 1,204	$	520	$ 520	$	416	$	416
	Integrated Guidance/Flt Control	216.7	355.1	1	1	2	2	$ 227	$ 5,457	$	400	$ 144	$	227	$ 5,457	$	455	$ 10,913	$	227	$ 5,457	$	455	$ 10,913	$	400	$ 400	$	640	$	640
Mission Equipment Package	In-Flight Test Equipment	2084.6	6666.7	1	1	1	1	$ 915	$ 6,068	$	-	$ 440	$	915	$ 6,068	$	915	$ 6,068	$	915	$ 6,068	$	915	$ 6,068	$	-	$ -	$	-	$	-
	Audio Distribution System	229.7	249.4	1	1	2	2	$ 159	$ 2,205	$	240	$ 152	$	159	$ 2,205	$	318	$ 4,411	$	159	$ 2,205	$	318	$ 4,411	$	240	$ 240	$	384	$	384
	Comm/Nav/FF Integration	139.5	290.8	2	1	3	2	$ 1,495	$ 5,193	$	228	$ 112	$	2,991	$ 10,386	$	4,486	$ 15,579	$	1,495	$ 5,193	$	2,991	$ 10,386	$	456	$ 228	$	547	$	365
	Radar Navigation System	1090.6	2199.0	1	1	1	1	$ 241	$ 2,119	$	280	$ 132	$	241	$ 2,119	$	241	$ 2,119	$	241	$ 2,119	$	241	$ 2,119	$	280	$ 280	$	224	$	224
	Electro-Optical Site System	53.9	59.8	5	4	7	7	$ 89	$ 10,140	$	280	$ 216	$	443	$ 50,702	$	620	$ 70,983	$	354	$ 40,562	$	620	$ 70,983	$	1,400	$ 1,120	$	1,568	$	1,568
	Aircraft Survivability Equipment	128.5	232.3	2	1	3	2	$ 5	$ 1,124	$	292	$ 172	$	10	$ 2,249	$	15	$ 3,373	$	5	$ 1,124	$	10	$ 2,249	$	684	$ 292	$	701	$	467
	Radar	58.7	104.0	4	3	7	4	$ 298	$ 5,981	$	184	$ 284	$	1,192	$ 23,924	$	2,086	$ 41,867	$	894	$ 17,943	$	1,192	$ 23,924	$	736	$ 552	$	1,030	$	589
	Weapons Management System	35.7	72.3	7	3	11	5	$ 66	$ 653	$	332	$ 160	$	462	$ 4,574	$	726	$ 7,188	$	198	$ 1,960	$	330	$ 3,267	$	2,324	$ 996	$	2,922	$	1,328
	KITS	830.0	2600.0	1	1	1	1	$ 819	$ 2,986	$	1,080	$ 40	$	819	$ 2,986	$	819	$ 2,986	$	819	$ 2,986	$	819	$ 2,986	$	1,080	$ 1,080	$	864	$	864
	Total Aircraft	2.12	4.78	122	63	191	96	$ 16,060	$ 108,690	$	28,320	$ 12,232	$	69,060	$ 294,067	$	108,600	$ 446,618	$	35,913	$ 191,967	$	54,921	$ 304,635	$	100,749	$ 46,828	$	166,144	$	67,245



2nd Reliability Improvement Level			Reliability Fact	0.98																											
System	Component	MTBUMA	MTBEMA	Maintenance Actions/Year (MTOE		Maintenance Actions/Year (TDA		Material Cost / Maint Action / Aircraft			Depot Labor Costs / Action / Aircraft			Yearly Cost for UMA per MTOE Aircraft			Yearly Cost for UMA per TDA Aircraft			Yearly Cost for EMA per MTOE Aircraft			Yearly Cost for EMA per TDA Aircraft			Yearly Depot Costs/ MTOE Aircraft		Yearly Depot Costs/ TDA Aircraft	
				UMA	EMA	UMA	EMA	Consumable	DLR		UMA	EMA		Consumable	DLR		Consumable	DLR		Consumable	DLR		Consumable	DLR		UMA	EMA	UMA	EMA
Air Vehicle	Airframe	9.5	37.4	23	6	38	10	$ 384	$ 124	$	2,456	$ 1,376	$	8,839	$ 2,854	$	14,604	$ 4,715	$	2,306	$ 745	$	3,843	$ 1,241	$	46,190	$ 11,789	$	74,662	$	19,648
	Landing Gear	35.6	79.0	7	3	11	5	$ 261	$ 452	$	544	$ 412	$	1,825	$ 3,167	$	2,868	$ 4,977	$	782	$ 1,357	$	1,304	$ 2,262	$	3,046	$ 1,306	$	4,787	$	2,176
	Flight Controls	163.0	358.5	2	1	3	2	$ 12	$ 1,507	$	3,200	$ 520	$	23	$ 3,014	$	35	$ 4,521	$	12	$ 1,507	$	23	$ 3,014	$	5,120	$ 2,560	$	7,680	$	5,120
	Drive System	40.7	74.1	6	3	9	5	$ 224	$ 1,499	$	572	$ 428	$	1,345	$ 8,995	$	2,017	$ 13,493	$	672	$ 4,498	$	1,121	$ 7,496	$	2,746	$ 1,373	$	4,118	$	2,288
	T800 Engine	156.1	245.9	4	2	6	4	$ 174	$ 23,253	$	280	$ 364	$	696	$ 93,012	$	1,043	$ 139,518	$	348	$ 46,506	$	696	$ 93,012	$	896	$ 448	$	1,344	$	896
	Secondary Power System	42.0	97.7	6	3	9	4	$ 247	$ 1,488	$	1,000	$ 584	$	1,464	$ 8,926	$	2,226	$ 13,388	$	742	$ 4,463	$	969	$ 5,950	$	4,800	$ 2,400	$	7,200	$	3,200
	Engine Interface	97.8	257.4	3	1	4	2	$ 445	$ 624	$	3,200	$ 520	$	1,334	$ 1,873	$	1,779	$ 2,497	$	445	$ 624	$	889	$ 1,248	$	7,680	$ 2,560	$	10,240	$	5,120
	Rotor	23.4	46.9	10	5	16	8	$ 2,681	$ 1,013	$	752	$ 624	$	26,809	$ 10,128	$	42,895	$ 16,206	$	13,405	$ 5,064	$	21,447	$ 8,103	$	6,016	$ 3,008	$	9,626	$	4,813
	Environmental Control System	35.6	74.9	7	3	11	5	$ 1,227	$ 364	$	444	$ 280	$	8,588	$ 2,550	$	13,496	$ 4,007	$	3,681	$ 1,093	$	6,135	$ 1,821	$	2,486	$ 1,066	$	3,907	$	1,776
	Electrical	37.3	77.1	6	3	10	5	$ 939	$ 541	$	640	$ 456	$	5,636	$ 3,244	$	9,394	$ 5,406	$	2,818	$ 1,622	$	4,697	$ 2,703	$	3,072	$ 1,536	$	5,120	$	2,560
	Pneudraulics	62.5	139.3	4	2	6	3	$ 29	$ 290	$	2,800	$ 520	$	116	$ 1,159	$	174	$ 1,739	$	58	$ 580	$	87	$ 869	$	8,960	$ 4,480	$	13,440	$	6,720
	Fuel	249.7	606.5	1	1	2	1	$ 91	$ 1,046	$	552	$ 560	$	91	$ 1,046	$	182	$ 2,092	$	91	$ 1,046	$	91	$ 1,046	$	442	$ 442	$	883	$	442
	Utility	92.0	259.0	3	1	4	2	$ 101	$ 515	$	372	$ 248	$	304	$ 1,545	$	406	$ 2,060	$	101	$ 515	$	203	$ 1,030	$	893	$ 298	$	1,190	$	595
	Weapons Control System	787.8	1388.5	1	1	1	1	$ 722	$ 6,020	$	1,600	$ 160	$	722	$ 6,020	$	722	$ 6,020	$	722	$ 6,020	$	722	$ 6,020	$	1,280	$ 1,280	$	1,280	$	1,280
	KITS	277.4	839.4	1	1	2	1	$ 773	$ 2,819	$	2,000	$ 600	$	773	$ 2,819	$	1,546	$ 5,639	$	773	$ 2,819	$	773	$ 2,819	$	1,600	$ 1,600	$	3,200	$	1,600
Armament	Weapons Control System	220.5	784.0	1	1	2	1	$ 682	$ 5,684	$	200	$ 60	$	682	$ 5,684	$	1,364	$ 11,368	$	682	$ 5,684	$	682	$ 5,684	$	200	$ 200	$	320	$	160
	Weapons	36.7	89.4	7	3	11	6	$ 107	$ 1,342	$	452	$ 268	$	751	$ 9,394	$	1,181	$ 14,761	$	322	$ 4,026	$	537	$ 6,710	$	3,164	$ 1,356	$	3,978	$	1,808
	KITS	93.7	255.5	3	1	4	2	$ 265	$ 967	$	480	$ 220	$	796	$ 2,902	$	1,061	$ 3,870	$	265	$ 967	$	531	$ 1,935	$	1,440	$ 480	$	1,536	$	768
Flight Controls	Flight Controls	7840.0	5880.0	1	1	1	1	$ 626	$ 4,286	$	680	$ 464	$	626	$ 4,286	$	626	$ 4,286	$	626	$ 4,286	$	626	$ 4,286	$	680	$ 680	$	544	$	544
	Engine Interface	475.3	1134.4	1	1	1	1	$ 1,372	$ 1,926	$	840	$ 508	$	1,372	$ 1,926	$	1,372	$ 1,926	$	1,372	$ 1,926	$	1,372	$ 1,926	$	840	$ 840	$	672	$	672
	Pneudraulics	348.4	784.0	1	1	2	1	$ 136	$ 1,114	$	680	$ 516	$	136	$ 1,114	$	273	$ 2,228	$	136	$ 1,114	$	136	$ 1,114	$	680	$ 680	$	1,088	$	544
	Instrument System	279.4	551.9	1	1	2	1	$ 5	$ 8,685	$	740	$ 332	$	5	$ 8,685	$	10	$ 17,370	$	5	$ 8,685	$	5	$ 8,685	$	740	$ 740	$	1,184	$	592
	Flight Reference System	9308.5	11296.9	1	1	1	1	$ 241	$ 1,204	$	520	$ 340	$	241	$ 1,204	$	241	$ 1,204	$	241	$ 1,204	$	241	$ 1,204	$	520	$ 520	$	416	$	416
	Integrated Guidance/Flt Control	212.4	348.0	2	1	2	2	$ 227	$ 5,457	$	400	$ 144	$	455	$ 10,913	$	455	$ 10,913	$	227	$ 5,457	$	455	$ 10,913	$	800	$ 400	$	640	$	640
Mission Equipment Package	In-Flight Test Equipment	2062.7	6426.6	1	1	1	1	$ 915	$ 6,068	$	-	$ 440	$	915	$ 6,068	$	915	$ 6,068	$	915	$ 6,068	$	915	$ 6,068	$	-	$ -	$	-	$	-
	Audio Distribution System	226.1	244.4	1	1	2	2	$ 159	$ 2,205	$	240	$ 152	$	159	$ 2,205	$	318	$ 4,411	$	159	$ 2,205	$	318	$ 4,411	$	240	$ 240	$	384	$	384
	Comm/Nav/FF Integration	136.7	285.0	2	1	3	2	$ 1,495	$ 5,193	$	228	$ 112	$	2,991	$ 10,386	$	4,486	$ 15,579	$	1,495	$ 5,193	$	2,991	$ 10,386	$	456	$ 228	$	547	$	365
	Radar Navigation System	1068.8	2155.0	1	1	1	1	$ 241	$ 2,119	$	280	$ 132	$	241	$ 2,119	$	241	$ 2,119	$	241	$ 2,119	$	241	$ 2,119	$	280	$ 280	$	224	$	224
	Electro-Optical Site System	52.8	58.6	5	4	7	7	$ 89	$ 10,140	$	280	$ 216	$	443	$ 50,702	$	620	$ 70,983	$	354	$ 40,562	$	620	$ 70,983	$	1,400	$ 1,120	$	1,568	$	1,568
	Aircraft Survivability Equipment	125.9	227.7	2	1	3	2	$ 5	$ 1,124	$	292	$ 172	$	10	$ 2,249	$	15	$ 3,373	$	5	$ 1,124	$	10	$ 2,249	$	584	$ 292	$	701	$	467
	Radar	57.5	101.9	4	3	7	4	$ 298	$ 5,981	$	184	$ 284	$	1,192	$ 23,924	$	2,086	$ 41,867	$	894	$ 17,943	$	1,192	$ 23,924	$	736	$ 552	$	1,030	$	589
	Weapons Management System	35.0	70.9	7	4	11	6	$ 66	$ 653	$	332	$ 160	$	462	$ 4,574	$	726	$ 7,188	$	264	$ 2,614	$	396	$ 3,921	$	2,324	$ 1,328	$	2,922	$	1,594
	KITS	813.4	2548.0	1	1	1	1	$ 819	$ 2,986	$	1,080	$ 40	$	819	$ 2,986	$	819	$ 2,986	$	819	$ 2,986	$	819	$ 2,986	$	1,080	$ 1,080	$	864	$	864
	Total Aircraft	2.076	4.68	126	64	194	99	$ 16,060	$ 108,690	$	28,320	$ 12,232	$	70,882	$ 301,672	$	110,195	$ 448,776	$	35,979	$ 192,620	$	55,106	$ 308,137	$	110,391	$ 47,160	$	167,296	$	70,432

O&M (DSW) cont.

1st Reliability Improvement Level — Reliability Fact 0.93

System	Component	MTBUMA	MTBEMA	Maintenance Actions/Year (MTOE UMA	Maintenance Actions/Year (MTOE EMA	Maintenance Actions/Year (TDA UMA	Maintenance Actions/Year (TDA EMA	Material Cost / Maint Action / Aircraft Consumable	Material Cost / Maint Action / Aircraft DLR	Depot Labor Costs / Action / Aircraft UMA	Depot Labor Costs / Action / Aircraft EMA	Yearly Cost for UMA per MTOE Aircraft Consumable	Yearly Cost for UMA per MTOE Aircraft DLR	Yearly Cost for UMA per TDA Aircraft Consumable	Yearly Cost for UMA per TDA Aircraft DLR	Yearly Cost for EMA per MTOE Aircraft Consumable	Yearly Cost for EMA per MTOE Aircraft DLR	Yearly Cost for EMA per TDA Aircraft Consumable	Yearly Cost for EMA per TDA Aircraft DLR	Yearly Depot Costs/ MTOE Aircraft UMA	Yearly Depot Costs/ MTOE Aircraft EMA	Yearly Depot Costs/ TDA Aircraft UMA	Yearly Depot Costs/ TDA Aircraft EMA
Air Vehicle	Airframe	9.0	35.5	24	7	40	11	$ 384	$ 124	$ 2,496	$ 1,376	$ 9,223	$ 2,979	$ 15,372	$ 4,964	$ 2,690	$ 869	$ 4,227	$ 1,365	$ 47,166	$ 13,754	$ 78,592	$ 21,613
	Landing Gear	33.8	75.0	7	3	11	5	$ 261	$ 452	$ 544	$ 412	$ 1,825	$ 3,167	$ 2,868	$ 4,977	$ 782	$ 1,357	$ 1,304	$ 2,262	$ 3,046	$ 1,306	$ 4,787	$ 2,176
	Flight Controls	154.7	340.2	2	1	3	2	$ 12	$ 1,507	$ 3,200	$ 520	$ 23	$ 3,014	$ 35	$ 4,521	$ 12	$ 1,507	$ 23	$ 3,014	$ 5,120	$ 2,560	$ 7,680	$ 5,120
	Drive System	38.6	70.3	6	4	10	6	$ 224	$ 1,499	$ 672	$ 428	$ 1,345	$ 8,996	$ 2,241	$ 14,993	$ 896	$ 5,997	$ 1,345	$ 8,995	$ 2,746	$ 1,830	$ 4,576	$ 2,746
	T800 Engine	148.1	233.3	4	2	6	4	$ 174	$ 23,253	$ 260	$ 364	$ 696	$ 93,012	$ 1,043	$ 139,518	$ 348	$ 46,506	$ 696	$ 93,012	$ 896	$ 448	$ 1,344	$ 896
	Secondary Power System	39.9	92.7	6	3	10	4	$ 247	$ 1,488	$ 1,000	$ 584	$ 1,484	$ 8,926	$ 2,473	$ 14,876	$ 742	$ 4,463	$ 989	$ 5,950	$ 4,800	$ 2,400	$ 8,000	$ 3,200
	Engine Interface	92.8	244.3	3	1	4	2	$ 445	$ 624	$ 3,200	$ 520	$ 1,334	$ 1,873	$ 1,779	$ 2,497	$ 445	$ 624	$ 889	$ 1,248	$ 7,680	$ 2,560	$ 10,240	$ 5,120
	Rotor	22.2	44.5	10	5	17	9	$ 2,881	$ 1,013	$ 752	$ 624	$ 26,809	$ 10,126	$ 45,576	$ 17,218	$ 13,405	$ 5,064	$ 24,128	$ 9,116	$ 6,016	$ 3,008	$ 10,227	$ 5,414
	Environmental Control System	33.8	71.1	7	4	11	6	$ 1,227	$ 364	$ 444	$ 260	$ 8,588	$ 2,550	$ 13,496	$ 4,007	$ 4,908	$ 1,457	$ 7,361	$ 2,185	$ 2,496	$ 1,421	$ 3,907	$ 2,131
	Electrical	35.4	73.2	7	3	11	6	$ 939	$ 541	$ 640	$ 456	$ 6,575	$ 3,784	$ 10,333	$ 5,947	$ 2,818	$ 1,622	$ 4,697	$ 2,703	$ 3,584	$ 1,536	$ 5,632	$ 2,560
	Pneudraulics	59.3	132.2	4	2	7	3	$ 29	$ 290	$ 2,800	$ 520	$ 116	$ 1,158	$ 203	$ 2,029	$ 58	$ 580	$ 87	$ 869	$ 6,960	$ 4,480	$ 15,680	$ 6,720
	Fuel	237.0	575.6	1	1	2	1	$ 91	$ 1,046	$ 552	$ 560	$ 91	$ 1,046	$ 182	$ 2,092	$ 91	$ 1,046	$ 91	$ 1,046	$ 442	$ 442	$ 883	$ 442
	Utility	97.3	245.8	3	1	5	2	$ 101	$ 515	$ 372	$ 248	$ 304	$ 1,545	$ 507	$ 2,575	$ 101	$ 515	$ 203	$ 1,030	$ 893	$ 298	$ 1,488	$ 596
	Weapons Control System	747.6	1317.6	1	1	1	1	$ 722	$ 6,020	$ 1,600	$ 160	$ 722	$ 6,020	$ 722	$ 6,020	$ 722	$ 6,020	$ 722	$ 6,020	$ 1,280	$ 1,280	$ 1,280	$ 1,280
	KITS	263.3	796.5	1	1	2	1	$ 773	$ 2,819	$ 2,000	$ 600	$ 773	$ 2,819	$ 1,546	$ 5,639	$ 773	$ 2,819	$ 773	$ 2,819	$ 1,600	$ 1,600	$ 3,200	$ 1,600
Armament	Weapons Control System	209.3	744.0	2	1	2	1	$ 682	$ 5,684	$ 200	$ 60	$ 1,364	$ 11,368	$ 1,364	$ 11,368	$ 682	$ 5,684	$ 682	$ 5,684	$ 400	$ 200	$ 320	$ 160
	Weapons	33.9	84.8	7	3	11	5	$ 107	$ 1,342	$ 452	$ 268	$ 751	$ 9,394	$ 1,181	$ 14,761	$ 322	$ 4,026	$ 537	$ 6,710	$ 3,164	$ 1,356	$ 3,978	$ 1,808
	KITS	88.9	242.5	3	1	5	2	$ 265	$ 967	$ 480	$ 220	$ 796	$ 2,902	$ 1,326	$ 4,837	$ 265	$ 967	$ 531	$ 1,935	$ 1,440	$ 480	$ 1,920	$ 768
Flight Controls	Flight Controls	7440.0	5580.0	1	1	1	1	$ 626	$ 4,286	$ 680	$ 484	$ 626	$ 4,286	$ 626	$ 4,286	$ 626	$ 4,286	$ 626	$ 4,286	$ 680	$ 680	$ 544	$ 544
	Engine Interface	451.1	1076.5	1	1	1	1	$ 1,372	$ 1,926	$ 840	$ 508	$ 1,372	$ 1,926	$ 1,372	$ 1,926	$ 1,372	$ 1,926	$ 1,372	$ 1,926	$ 840	$ 840	$ 672	$ 672
	Pneudraulics	330.6	744.0	1	1	2	1	$ 136	$ 1,114	$ 680	$ 516	$ 136	$ 1,114	$ 273	$ 2,228	$ 136	$ 1,114	$ 136	$ 1,114	$ 680	$ 680	$ 1,088	$ 544
	Instrument System	365.1	523.8	1	1	2	1	$ 5	$ 8,695	$ 740	$ 332	$ 5	$ 8,695	$ 10	$ 17,370	$ 5	$ 8,695	$ 5	$ 8,695	$ 740	$ 740	$ 1,184	$ 592
	Flight Reference System	8833.6	10720.5	1	1	1	1	$ 241	$ 1,204	$ 520	$ 340	$ 241	$ 1,204	$ 241	$ 1,204	$ 241	$ 1,204	$ 241	$ 1,204	$ 520	$ 520	$ 416	$ 416
	Integrated Guidance/Flt Control	201.5	330.2	2	1	2	2	$ 227	$ 5,457	$ 400	$ 144	$ 455	$ 10,913	$ 455	$ 10,913	$ 227	$ 5,457	$ 455	$ 10,913	$ 800	$ 400	$ 640	$ 640
Mission Equipment Package	In-Flight Test Equipment	1948.0	6097.7	1	1	1	1	$ 915	$ 6,068	$ -	$ 440	$ 915	$ 6,068	$ 915	$ 6,068	$ 915	$ 6,068	$ 915	$ 6,068	$ -	$ -	$ -	$ -
	Audio Distribution System	213.6	231.9	2	1	2	2	$ 159	$ 2,205	$ 240	$ 152	$ 318	$ 4,411	$ 318	$ 4,411	$ 159	$ 2,205	$ 318	$ 4,411	$ 480	$ 240	$ 384	$ 384
	Comm/Nav/IFF Integration	129.7	270.4	2	1	3	2	$ 1,495	$ 5,193	$ 228	$ 112	$ 2,991	$ 10,386	$ 4,486	$ 15,579	$ 1,495	$ 5,193	$ 2,991	$ 10,386	$ 456	$ 228	$ 547	$ 365
	Radar Navigation System	1014.3	2045.1	1	1	1	1	$ 241	$ 2,119	$ 260	$ 132	$ 241	$ 2,119	$ 241	$ 2,119	$ 241	$ 2,119	$ 241	$ 2,119	$ 260	$ 260	$ 224	$ 224
	Electro-Optical Site System	60.1	66.6	6	4	8	7	$ 89	$ 10,140	$ 260	$ 216	$ 443	$ 60,702	$ 709	$ 81,123	$ 354	$ 40,562	$ 620	$ 70,983	$ 1,400	$ 1,120	$ 1,792	$ 1,568
	Aircraft Survivability Equipment	119.5	216.0	2	1	4	2	$ 5	$ 1,124	$ 292	$ 172	$ 10	$ 2,249	$ 20	$ 4,498	$ 5	$ 1,124	$ 10	$ 2,249	$ 584	$ 292	$ 934	$ 467
	Radar	54.6	96.7	4	3	7	4	$ 298	$ 5,981	$ 184	$ 284	$ 1,192	$ 23,924	$ 2,086	$ 41,867	$ 894	$ 17,943	$ 1,192	$ 23,924	$ 736	$ 552	$ 1,030	$ 589
	Weapons Management System	33.2	67.2	7	4	11	6	$ 66	$ 653	$ 332	$ 160	$ 462	$ 4,574	$ 726	$ 7,186	$ 264	$ 2,614	$ 396	$ 3,921	$ 2,324	$ 1,328	$ 2,922	$ 1,594
	KITS	771.9	2418.0	1	1	1	1	$ 819	$ 2,986	$ 1,080	$ 40	$ 819	$ 2,986	$ 819	$ 2,986	$ 819	$ 2,986	$ 819	$ 2,986	$ 1,080	$ 1,080	$ 864	$ 864
	Total Aircraft	1.97	4.44	130	67	205	103	$ 16,060	$ 109,690	$ 28,320	$ 12,232	$ 73,047	$ 310,227	$ 115,544	$ 466,602	$ 37,815	$ 194,608	$ 59,622	$ 311,136	$ 113,306	$ 49,938	$ 176,976	$ 73,811

Initial Reliability Level — Reliability Fact 0.85

System	Component	MTBUMA	MTBEMA	Maintenance Actions/Year (MTOE UMA	Maintenance Actions/Year (MTOE EMA	Maintenance Actions/Year (TDA UMA	Maintenance Actions/Year (TDA EMA	Material Cost / Maint Action / Aircraft Consumable	Material Cost / Maint Action / Aircraft DLR	Depot Labor Costs / Action / Aircraft UMA	Depot Labor Costs / Action / Aircraft EMA	Yearly Cost for UMA per MTOE Aircraft Consumable	Yearly Cost for UMA per MTOE Aircraft DLR	Yearly Cost for UMA per TDA Aircraft Consumable	Yearly Cost for UMA per TDA Aircraft DLR	Yearly Cost for EMA per MTOE Aircraft Consumable	Yearly Cost for EMA per MTOE Aircraft DLR	Yearly Cost for EMA per TDA Aircraft Consumable	Yearly Cost for EMA per TDA Aircraft DLR	Yearly Depot Costs/ MTOE Aircraft UMA	Yearly Depot Costs/ MTOE Aircraft EMA	Yearly Depot Costs/ TDA Aircraft UMA	Yearly Depot Costs/ TDA Aircraft EMA
Air Vehicle	Airframe	8.2	32.5	27	7	44	12	$ 384	$ 124	$ 2,496	$ 1,376	$ 10,376	$ 3,351	$ 16,910	$ 5,460	$ 2,690	$ 869	$ 4,612	$ 1,489	$ 53,050	$ 13,754	$ 86,451	$ 23,576
	Landing Gear	30.9	68.5	8	4	12	6	$ 261	$ 452	$ 544	$ 412	$ 2,086	$ 3,619	$ 3,129	$ 5,429	$ 1,043	$ 1,810	$ 1,564	$ 2,715	$ 3,482	$ 1,741	$ 5,222	$ 2,611
	Flight Controls	141.4	310.9	2	1	3	2	$ 12	$ 1,507	$ 3,200	$ 520	$ 23	$ 3,014	$ 35	$ 4,521	$ 12	$ 1,507	$ 23	$ 3,014	$ 5,120	$ 2,560	$ 7,680	$ 5,120
	Drive System	35.3	64.3	7	4	11	6	$ 224	$ 1,499	$ 672	$ 428	$ 1,569	$ 10,494	$ 2,465	$ 16,491	$ 896	$ 5,997	$ 1,345	$ 8,995	$ 3,201	$ 1,830	$ 5,034	$ 2,746
	T800 Engine	135.4	213.3	4	4	6	4	$ 174	$ 23,253	$ 260	$ 364	$ 696	$ 93,012	$ 1,043	$ 139,518	$ 696	$ 93,012	$ 696	$ 93,012	$ 896	$ 896	$ 1,344	$ 896
	Secondary Power System	36.5	84.7	6	3	10	5	$ 247	$ 1,488	$ 1,000	$ 584	$ 1,484	$ 8,926	$ 2,473	$ 14,876	$ 742	$ 4,463	$ 1,236	$ 7,438	$ 4,800	$ 2,400	$ 8,000	$ 4,000
	Engine Interface	84.6	223.3	3	1	5	2	$ 445	$ 624	$ 3,200	$ 520	$ 1,334	$ 1,873	$ 2,224	$ 3,121	$ 445	$ 624	$ 889	$ 1,248	$ 7,680	$ 2,560	$ 12,800	$ 5,120
	Rotor	20.3	40.7	11	6	18	9	$ 2,881	$ 1,013	$ 752	$ 624	$ 29,490	$ 11,141	$ 49,251	$ 18,931	$ 16,096	$ 6,077	$ 24,128	$ 9,116	$ 6,016	$ 3,610	$ 10,629	$ 5,414
	Environmental Control System	30.9	64.9	8	4	12	6	$ 1,227	$ 364	$ 444	$ 260	$ 9,815	$ 2,914	$ 14,723	$ 4,371	$ 4,908	$ 1,457	$ 7,361	$ 2,185	$ 2,842	$ 1,421	$ 4,262	$ 2,131
	Electrical	32.4	66.9	7	4	12	6	$ 939	$ 541	$ 640	$ 456	$ 6,575	$ 3,784	$ 11,272	$ 6,487	$ 3,757	$ 2,162	$ 5,636	$ 3,244	$ 3,584	$ 2,048	$ 6,144	$ 3,072
	Pneudraulics	54.2	120.8	4	2	7	3	$ 29	$ 290	$ 2,800	$ 520	$ 116	$ 1,158	$ 203	$ 2,029	$ 58	$ 580	$ 87	$ 869	$ 8,960	$ 4,480	$ 15,680	$ 6,720
	Fuel	216.6	526.1	1	1	2	1	$ 91	$ 1,046	$ 552	$ 560	$ 91	$ 1,046	$ 182	$ 2,092	$ 91	$ 1,046	$ 91	$ 1,046	$ 442	$ 442	$ 883	$ 442
	Utility	79.8	224.7	3	1	5	2	$ 101	$ 515	$ 372	$ 248	$ 304	$ 1,545	$ 507	$ 2,575	$ 101	$ 515	$ 203	$ 1,030	$ 893	$ 298	$ 1,488	$ 596
	Weapons Control System	683.3	1204.3	1	1	1	1	$ 722	$ 6,020	$ 1,600	$ 160	$ 722	$ 6,020	$ 722	$ 6,020	$ 722	$ 6,020	$ 722	$ 6,020	$ 1,280	$ 1,280	$ 1,280	$ 1,280
	KITS	240.6	728.0	1	1	2	1	$ 773	$ 2,819	$ 2,000	$ 600	$ 773	$ 2,819	$ 1,546	$ 5,639	$ 773	$ 2,819	$ 773	$ 2,819	$ 1,600	$ 1,600	$ 3,200	$ 1,600
Armament	Weapons Control System	191.3	680.0	2	1	2	1	$ 682	$ 5,684	$ 200	$ 60	$ 1,364	$ 11,368	$ 1,364	$ 11,368	$ 682	$ 5,684	$ 682	$ 5,684	$ 400	$ 200	$ 320	$ 160
	Weapons	30.9	77.5	7	3	12	5	$ 107	$ 1,342	$ 452	$ 268	$ 751	$ 9,394	$ 1,288	$ 16,103	$ 322	$ 4,026	$ 537	$ 6,710	$ 3,164	$ 1,356	$ 4,339	$ 1,808
	KITS	81.3	221.6	3	1	5	2	$ 265	$ 967	$ 480	$ 220	$ 796	$ 2,902	$ 1,326	$ 4,837	$ 265	$ 967	$ 531	$ 1,935	$ 1,440	$ 480	$ 1,920	$ 768
Flight Controls	Flight Controls	6800.0	5100.0	1	1	1	1	$ 626	$ 4,286	$ 680	$ 484	$ 626	$ 4,286	$ 626	$ 4,286	$ 626	$ 4,286	$ 626	$ 4,286	$ 680	$ 680	$ 544	$ 544
	Engine Interface	412.3	983.9	1	1	1	1	$ 1,372	$ 1,926	$ 840	$ 508	$ 1,372	$ 1,926	$ 1,372	$ 1,926	$ 1,372	$ 1,926	$ 1,372	$ 1,926	$ 840	$ 840	$ 672	$ 672
	Pneudraulics	302.2	680.0	1	1	2	1	$ 136	$ 1,114	$ 680	$ 516	$ 136	$ 1,114	$ 273	$ 2,228	$ 136	$ 1,114	$ 136	$ 1,114	$ 680	$ 680	$ 1,088	$ 544
	Instrument System	242.3	478.7	1	1	2	1	$ 5	$ 8,695	$ 740	$ 332	$ 5	$ 8,695	$ 10	$ 17,370	$ 5	$ 8,695	$ 5	$ 8,695	$ 740	$ 740	$ 1,184	$ 592
	Flight Reference System	8073.7	9798.3	1	1	1	1	$ 241	$ 1,204	$ 520	$ 340	$ 241	$ 1,204	$ 241	$ 1,204	$ 241	$ 1,204	$ 241	$ 1,204	$ 520	$ 520	$ 416	$ 416
	Integrated Guidance/Flt Control	184.2	301.8	2	1	2	2	$ 227	$ 5,457	$ 400	$ 144	$ 455	$ 10,913	$ 455	$ 10,913	$ 227	$ 5,457	$ 455	$ 10,913	$ 800	$ 400	$ 640	$ 640
Mission Equipment Package	In-Flight Test Equipment	1780.4	5573.2	1	1	1	1	$ 915	$ 6,068	$ -	$ 440	$ 915	$ 6,068	$ 915	$ 6,068	$ 915	$ 6,068	$ 915	$ 6,068	$ -	$ -	$ -	$ -
	Audio Distribution System	195.2	212.0	2	2	2	2	$ 159	$ 2,205	$ 240	$ 152	$ 318	$ 4,411	$ 318	$ 4,411	$ 318	$ 4,411	$ 318	$ 4,411	$ 480	$ 480	$ 384	$ 384
	Comm/Nav/IFF Integration	118.6	247.2	2	1	4	2	$ 1,495	$ 5,193	$ 228	$ 112	$ 2,991	$ 10,386	$ 5,981	$ 20,772	$ 1,495	$ 5,193	$ 2,991	$ 10,386	$ 456	$ 228	$ 730	$ 365
	Radar Navigation System	927.0	1869.2	1	1	1	1	$ 241	$ 2,119	$ 260	$ 132	$ 241	$ 2,119	$ 241	$ 2,119	$ 241	$ 2,119	$ 241	$ 2,119	$ 260	$ 260	$ 224	$ 224
	Electro-Optical Site System	45.8	50.8	5	5	8	8	$ 89	$ 10,140	$ 280	$ 216	$ 443	$ 50,702	$ 709	$ 81,123	$ 443	$ 50,702	$ 709	$ 81,123	$ 1,400	$ 1,400	$ 1,792	$ 1,792
	Aircraft Survivability Equipment	109.2	197.5	2	2	4	2	$ 5	$ 1,124	$ 292	$ 172	$ 10	$ 2,249	$ 20	$ 4,498	$ 10	$ 2,249	$ 10	$ 2,249	$ 584	$ 584	$ 934	$ 467
	Radar	49.9	88.4	5	3	8	5	$ 298	$ 5,981	$ 184	$ 284	$ 1,490	$ 29,905	$ 2,384	$ 47,848	$ 894	$ 17,943	$ 1,490	$ 29,905	$ 920	$ 552	$ 1,178	$ 736
	Weapons Management System	30.3	61.5	8	4	12	6	$ 66	$ 653	$ 332	$ 160	$ 528	$ 5,228	$ 792	$ 7,842	$ 264	$ 2,614	$ 396	$ 3,921	$ 2,656	$ 1,328	$ 3,187	$ 1,594
	KITS	705.6	2210.0	1	1	1	1	$ 819	$ 2,986	$ 1,080	$ 40	$ 819	$ 2,986	$ 819	$ 2,986	$ 819	$ 2,986	$ 819	$ 2,986	$ 1,080	$ 1,080	$ 864	$ 864
	Total Aircraft	1.80	4.06	139	75	219	109	$ 16,060	$ 109,690	$ 28,320	$ 12,232	$ 78,956	$ 320,562	$ 124,825	$ 484,761	$ 42,296	$ 256,590	$ 61,840	$ 329,864	$ 121,568	$ 52,746	$ 190,714	$ 77,894

O&M (DSW) cont.

	A	B	C	D	E	F	G	H	I	J	K
174	FY Year		2002	2003	2004	2005	2006	2007	2008	2009	2010
175	Year		0	1	2	3	4	5	6	7	8
176	Lt Attack Aircraft										
177	Number of New Aircraft Fielded		0	0	0	0	0	0	0	0	24
178	Number of Decommissioned Aircraft		0	0	0	0	0	0	0	0	0
179	Total Number of Aircraft		0	0	0	0	0	0	0	0	24
180	Hvy Attack Aircraft										
181	Number of New Aircraft Fielded		0	0	0	0	0	0	0	0	0
182	Number of Decommissioned Aircraft		0	0	0	0	0	0	0	0	0
183	Total Number of Aircraft		0	0	0	0	0	0	0	0	0
184	Div Cav Aircraft										
185	Number of New Aircraft Fielded		0	0	0	0	16	8	0	0	24
186	Number of Decommissioned Aircraft		0	0	0	0	0	0	0	0	0
187	Total Number of Aircraft		0	0	0	0	16	24	24	24	48
188	Reg Avn Squadron Aircraft										
189	Number of New Aircraft Fielded		0	0	0	0	0	12	36	36	6
190	Number of Decommissioned Aircraft		0	0	0	0	0	0	0	0	0
191	Total Number of Aircraft		0	0	0	0	0	12	48	84	90
192	SOAR Aircraft										
193	Number of New Aircraft Fielded		0	0	0	0	0	0	0	16	0
194	Number of Decommissioned Aircraft		0	0	0	0	0	0	0	0	0
195	Total Number of Aircraft		0	0	0	0	0	0	0	16	16
196	MTOE Aircraft Summary										
197	# of New MTOE Aircraft		0	0	0	0	16	20	36	52	54
198	# of MTOE Aircraft Decommissioned		0	0	0	0	0	0	0	0	0
199	Total Number of MTOE Aircraft		0	0	0	0	16	36	72	124	178
200	TRADOC Aircraft										
201	Number of New Aircraft Fielded		0	0	0	0	6	6	6	6	4
202	Number of Decommissioned Aircraft		0	0	0	0	0	0	0	0	0
203	Total Number of Aircraft		0	0	0	0	6	12	18	24	28
204	TDA Aircraft Summary										
205	# of New TDA Aircraft		0	0	0	0	6	6	6	6	4
206	# of TDA Aircraft Decommissioned		0	0	0	0	0	0	0	0	0
207	Total Number of TDA Aircraft		0	0	0	0	6	12	18	24	28
208	Float Aircraft										
209	Number of New Aircraft Fielded		0	0	0	0	0	0	2	2	2
210	Number of Decommissioned Aircraft		0	0	0	0	0	0	0	0	0
211	Total Number of Aircraft		0	0	0	0	0	0	2	4	6
212											
213	Operation Costs										
214	POL		$ -	$ -	$ -	$ -	$ 577,499	$ 1,268,721	$ 2,357,103	$ 3,865,649	$ 5,401,537
215	Training Munitions		$ -	$ -	$ -	$ -	$ 1,320,000	$ 2,880,000	$ 5,400,000	$ 8,880,000	$ 12,360,000
216	Maintenance Costs										
217	Consumables for Essential Maintenance Actions		$ -	$ -	$ -	$ -	$ -	$ 962,766	$ 2,020,328	$ 3,673,417	$ 5,901,910
218	Repairables for Essential Maintenance Actions		$ -	$ -	$ -	$ -	$ -	$ 4,980,550	$ 10,689,728	$ 19,473,209	$ 31,335,999
219	Consumables for Unscheduled Maintenance Actions		$ -	$ -	$ -	$ -	$ -	$ 1,482,322	$ 1,929,151	$ 3,484,890	$ 5,592,045
220	Repairables for Unscheduled Maintenance Actions		$ -	$ -	$ -	$ -	$ -	$ 2,782,684	$ 5,833,827	$ 10,605,279	$ 17,093,719
221	Transportation		$ -	$ -	$ -	$ -	$ -	$ 496,500	$ 1,051,500	$ 1,903,800	$ 3,056,100
222	Depot Costs										
223	Essential Maintenance Actions		$ -	$ -	$ -	$ -	$ -	$ 1,241,869	$ 2,618,771	$ 4,759,130	$ 7,652,720
224	Unscheduled Maintenance Actions		$ -	$ -	$ -	$ -	$ -	$ 1,632,915	$ 3,479,280	$ 6,330,259	$ 10,187,696
225	Contractor Logistics Support Costs										
226	Contractor Logistics Support		$ -	$ -	$ -	$ 138,500,000	$ 77,750,000	$ 165,000,000	$ 147,250,000	$ 165,500,000	$ 83,500,000
227	System Sustainment										
228	Software Support Costs		$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -
229	Systems Engineering Costs		$ 500,000	$ 500,000	$ 500,000	$ 121,000	$ 124,000	$ 127,000	$ 130,000	$ 133,000	$ 136,000
230											
231											
232	Total (Constant $)		$ 500,000	$ 500,000	$ 500,000	$ 138,621,000	$ 79,771,499	$ 182,855,328	$ 182,759,689	$ 228,608,632	$ 182,217,725
233	Inflation (Then Yr $)		$ 500,000	$ 520,000	$ 540,800	$ 155,929,773	$ 93,321,371	$ 222,471,465	$ 231,249,310	$ 300,833,364	$ 249,377,539
234	PV (FY 2002 $)		$ 500,000	$ 484,496	$ 469,473	$ 126,121,735	$ 70,328,113	$ 156,210,108	$ 151,287,214	$ 183,372,727	$ 141,629,278
235	NPV		$ 7,684,353,561								

O&M (DSW) cont.

	L	M	N	O	P	Q	R	S	T	U	V	W
174	2011	2012	2013	2014	2015	2016	2017	2018	2019	2020	2021	2022
175	9	10	11	12	13	14	15	16	17	18	19	20
176												
177	0	0	0	36	12	0	0	0	0	24	0	0
178	0	0	0	0	0	0	0	0	0	0	0	0
179	24	24	24	60	72	72	72	72	72	96	96	96
180												
181	0	0	0	0	9	63	63	45	0	0	0	45
182	0	0	0	0	0	0	0	0	0	0	0	0
183	0	0	0	0	9	72	135	180	180	180	180	225
184												
185	30	66	48	0	0	0	0	24	64	40	64	0
186	0	0	0	0	0	0	0	0	0	0	0	0
187	78	144	192	192	192	192	192	216	280	320	384	384
188												
189	36	0	20	28	42	0	0	0	0	0	0	0
190	0	0	0	0	0	0	0	0	0	0	0	0
191	126	126	146	174	216	216	216	216	216	216	216	216
192												
193	0	0	0	0	0	0	0	0	0	0	0	0
194	0	0	0	0	0	0	0	0	0	0	0	0
195	16	16	16	16	16	16	16	16	16	16	16	16
196												
197	66	66	68	64	63	63	63	69	64	64	64	45
198	0	0	0	0	0	0	0	0	0	0	0	0
199	244	310	378	442	505	568	631	700	764	828	892	937
200												
201	4	4	4	6	6	6	6	3	6	5	0	0
202	0	0	0	0	0	0	0	0	0	0	0	0
203	32	36	40	46	52	58	64	67	73	78	78	78
204												
205	4	4	4	6	6	6	6	3	6	5	0	0
206	0	0	0	0	0	0	0	0	0	0	0	0
207	32	36	40	46	52	58	64	67	73	78	78	78
208												
209	2	2	0	2	3	3	3	0	2	3	8	27
210	0	0	0	0	0	0	0	0	0	0	0	0
211	8	10	10	12	15	18	21	21	23	26	34	61
212												
213												
214	$ 7,291,594	$ 9,255,093	$ 11,345,243	$ 13,497,948	$ 15,705,678	$ 17,996,318	$ 20,372,301	$ 22,864,295	$ 25,447,820	$ 28,076,693	$ 30,551,428	$ 32,534,580
215	$ 16,560,000	$ 20,760,000	$ 25,080,000	$ 29,280,000	$ 33,420,000	$ 37,560,000	$ 41,700,000	$ 46,020,000	$ 50,220,000	$ 54,360,000	$ 58,200,000	$ 60,900,000
216												
217	$ 11,095,269	$ 13,707,806	$ 16,383,149	$ 19,003,234	$ 21,590,842	$ 24,181,108	$ 26,773,103	$ 29,433,419	$ 32,047,543	$ 34,618,115	$ 36,877,490	$ 38,348,623
218	$ 61,177,851	$ 75,092,187	$ 89,501,550	$ 103,412,477	$ 117,273,314	$ 131,196,776	$ 145,117,835	$ 159,589,494	$ 173,462,082	$ 187,235,614	$ 199,396,074	$ 206,770,722
219	$ 10,295,967	$ 12,724,060	$ 15,220,826	$ 17,672,988	$ 20,079,418	$ 22,483,415	$ 24,891,946	$ 27,333,243	$ 29,792,810	$ 32,175,868	$ 34,243,906	$ 35,656,094
220	$ 28,127,769	$ 35,612,618	$ 43,130,001	$ 50,721,041	$ 58,029,523	$ 65,269,051	$ 72,545,680	$ 79,748,412	$ 87,404,155	$ 94,653,543	$ 101,070,434	$ 106,322,685
221	$ 5,674,200	$ 7,011,300	$ 8,382,600	$ 9,726,300	$ 11,049,150	$ 12,371,250	$ 13,695,450	$ 15,046,800	$ 16,390,650	$ 17,703,450	$ 18,849,900	$ 19,614,000
222												
223	$ 14,241,650	$ 17,632,882	$ 21,101,986	$ 24,506,291	$ 27,855,364	$ 31,210,934	$ 34,564,234	$ 38,000,662	$ 41,402,438	$ 44,721,586	$ 47,666,666	$ 49,625,457
224	$ 18,935,853	$ 23,442,309	$ 28,078,046	$ 32,637,509	$ 37,130,367	$ 41,614,011	$ 46,107,106	$ 50,675,984	$ 55,235,467	$ 59,698,491	$ 63,574,899	$ 66,210,927
225												
226	$ 34,500,000	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -
227												
228	$ -	$ -	$ -	$ -	$ -	$ -	$ 75,000,000	$ 65,000,000	$ 35,000,000	$ 35,000,000	$ 70,000,000	$ 35,000,000
229	$ 139,000	$ 142,000	$ 145,000	$ 148,000	$ 151,000	$ 154,000	$ 10,000,000	$ 10,000,000	$ 10,000,000	$ 10,000,000	$ 9,000,000	$ 9,000,000
230												
231												
232	$ 208,039,153	$ 215,380,256	$ 258,368,403	$ 300,605,788	$ 342,284,656	$ 384,036,862	$ 510,767,656	$ 543,712,310	$ 556,392,964	$ 598,243,360	$ 669,430,798	$ 659,983,088
233	$ 296,104,584	$ 318,815,392	$ 397,746,286	$ 481,279,552	$ 569,929,113	$ 665,027,589	$ 919,863,693	$ 1,018,362,960	$ 1,083,798,130	$ 1,211,931,279	$ 1,410,389,724	$ 1,446,104,218
234	$ 156,685,137	$ 157,184,209	$ 182,710,174	$ 205,987,550	$ 227,274,843	$ 247,091,127	$ 318,440,230	$ 328,468,713	$ 325,706,762	$ 339,346,470	$ 367,952,231	$ 351,510,952

O&M (DSW) cont.

	X	Y	Z	AA	AB	AC	AD	AE	AF	AG	AH	AI
174	2023	2024	2025	2026	2027	2028	2029	2030	2031	2032	2033	2034
175	21	22	23	24	25	26	27	28	29	30	31	32
176												
177	0	0	0	0	0	0	0	0	0	0	0	0
178	0	0	0	0	0	0	0	24	0	0	0	36
179	96	96	96	96	96	96	96	72	72	72	72	36
180												
181	36	0	0	0	0	0	0	0	0	0	0	0
182	0	0	0	0	0	0	0	0	0	0	0	0
183	261	261	261	261	261	261	261	261	261	261	261	261
184												
185	0	0	0	0	0	0	0	0	0	0	0	0
186	0	0	0	16	8	0	0	24	30	66	48	0
187	384	384	384	368	360	360	360	336	306	240	192	192
188												
189	0	0	0	0	0	0	0	0	0	0	0	0
190	0	0	0	0	12	36	36	6	36	0	20	28
191	216	216	216	216	204	168	132	126	90	90	70	42
192												
193	0	0	0	0	0	0	0	0	0	0	0	0
194	0	0	0	0	0	0	16	0	0	0	0	0
195	16	16	16	16	16	16	0	0	0	0	0	0
196												
197	36	0	0	0	0	0	0	0	0	0	0	0
198	0	0	0	16	20	36	52	54	66	66	68	64
199	973	973	973	957	937	901	849	795	729	663	595	531
200												
201	0	0	0	0	0	0	0	0	0	0	0	0
202	0	0	0	6	6	6	6	4	4	4	4	6
203	78	78	78	72	66	60	54	50	46	42	38	32
204												
205	0	0	0	0	0	0	0	0	0	0	0	0
206	0	0	0	6	6	6	6	4	4	4	4	6
207	78	78	78	72	66	60	54	50	46	42	38	32
208												
209	36	65	0	0	0	0	0	0	0	0	0	0
210	0	0	0	0	0	2	2	2	2	2	0	2
211	97	162	162	162	162	160	158	156	154	152	152	150
212												
213												
214	$ 34,304,925	$ 34,991,024	$ 35,690,844	$ 35,546,528	$ 35,247,501	$ 34,372,878	$ 32,888,767	$ 31,379,176	$ 29,358,762	$ 27,244,979	$ 24,959,077	$ 22,596,622
215	$ 63,060,000	$ 63,060,000	$ 63,060,000	$ 61,740,000	$ 60,180,000	$ 57,660,000	$ 54,180,000	$ 50,700,000	$ 46,500,000	$ 42,300,000	$ 37,980,000	$ 33,780,000
216												
217	$ 39,549,171	$ 39,359,916	$ 39,443,177	$ 38,593,672	$ 37,678,189	$ 36,153,104	$ 33,977,831	$ 31,895,556	$ 29,309,506	$ 26,734,043	$ 24,058,664	$ 21,424,307
218	$ 213,063,694	$ 210,784,965	$ 211,890,399	$ 207,278,770	$ 202,682,153	$ 194,977,628	$ 183,278,030	$ 172,470,071	$ 158,591,402	$ 144,834,094	$ 130,351,143	$ 116,172,841
219	$ 36,807,613	$ 36,682,822	$ 36,740,427	$ 35,900,318	$ 35,005,613	$ 33,567,260	$ 31,535,029	$ 29,576,097	$ 27,173,694	$ 24,772,739	$ 22,306,546	$ 19,859,598
220	$ 110,194,009	$ 111,637,423	$ 110,720,843	$ 108,160,248	$ 104,889,720	$ 99,836,315	$ 93,735,994	$ 87,211,688	$ 79,902,313	$ 72,486,057	$ 65,140,762	$ 57,793,199
221	$ 20,237,100	$ 20,157,300	$ 20,189,100	$ 19,741,800	$ 19,264,200	$ 18,479,700	$ 17,367,300	$ 16,296,300	$ 14,974,800	$ 13,655,300	$ 12,294,300	$ 10,948,650
222												
223	$ 51,207,416	$ 51,050,539	$ 51,111,948	$ 50,026,018	$ 48,824,727	$ 46,827,215	$ 44,016,543	$ 41,290,537	$ 37,942,175	$ 34,594,747	$ 31,135,980	$ 27,729,601
224	$ 68,369,358	$ 68,137,014	$ 68,293,732	$ 66,734,193	$ 65,042,679	$ 62,340,641	$ 58,530,721	$ 54,876,831	$ 50,388,049	$ 45,920,903	$ 41,313,479	$ 36,750,252
225												
226	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -
227												
228	$ 35,000,000	$ 35,000,000	$ 70,000,000	$ 35,000,000	$ 35,000,000	$ 35,000,000	$ 35,000,000	$ 70,000,000	$ 35,000,000	$ 35,000,000	$ 35,000,000	$ 60,000,000
229	$ 9,000,000	$ 9,000,000	$ 8,000,000	$ 8,000,000	$ 8,000,000	$ 8,000,000	$ 7,000,000	$ 7,000,000	$ 7,000,000	$ 7,000,000	$ 6,000,000	$ 6,000,000
230												
231												
232	$ 680,793,284	$ 679,861,003	$ 715,140,441	$ 686,721,547	$ 651,814,782	$ 627,214,741	$ 591,510,214	$ 592,696,256	$ 516,140,700	$ 474,543,873	$ 430,539,953	$ 413,055,070
233	$ 1,551,369,998	$ 1,611,215,366	$ 1,762,617,762	$ 1,709,010,119	$ 1,737,631,527	$ 1,738,933,918	$ 1,705,541,963	$ 1,777,320,229	$ 1,609,662,943	$ 1,539,134,416	$ 1,452,268,699	$ 1,449,021,451
234	$ 351,351,345	$ 339,990,506	$ 346,543,933	$ 313,063,010	$ 296,573,111	$ 276,531,193	$ 252,703,014	$ 245,358,247	$ 207,041,252	$ 184,452,886	$ 162,159,667	$ 150,750,112

O&M (DSW) cont.

	AJ	AK	AL	AM	AN	AO	AP	AQ	AR	AS
174	2035	2036	2037	2038	2039	2040	2041	2042	2043	2044
175	33	34	35	36	37	38	39	40	41	42
176										
177	0	0	0	0	0	0	0	0	0	0
178	12	0	0	0	0	24	0	0	0	0
179	24	24	24	24	24	0	0	0	0	0
180										
181	0	0	0	0	0	0	0	0	0	0
182	9	63	63	45	0	0	0	45	36	0
183	252	189	126	81	81	81	81	36	0	0
184										
185	0	0	0	0	0	0	0	0	0	0
186	0	0	0	24	64	40	64	0	0	0
187	192	192	192	168	104	64	0	0	0	0
188										
189	0	0	0	0	0	0	0	0	0	0
190	42	0	0	0	0	0	0	0	0	0
191	0	0	0	0	0	0	0	0	0	0
192										
193	0	0	0	0	0	0	0	0	0	0
194	0	0	0	0	0	0	0	0	0	0
195	0	0	0	0	0	0	0	0	0	0
196										
197	0	0	0	0	0	0	0	0	0	0
198	63	63	63	69	64	64	64	45	36	0
199	468	405	342	273	209	145	81	36	0	0
200										
201	0	0	0	0	0	0	0	0	0	0
202	6	6	6	3	6	5	0	0	0	0
203	26	20	14	11	5	0	0	0	0	0
204										
205	0	0	0	0	0	0	0	0	0	0
206	6	6	6	3	6	5	0	0	0	0
207	26	20	14	11	5	0	0	0	0	0
208										
209	0	0	0	0	0	0	0	0	0	0
210	3	3	3	0	2	3	8	27	36	65
211	147	144	141	141	139	136	128	101	65	0
212										
213										
214	$ 20,169,128	$ 17,635,497	$ 14,992,452	$ 12,194,773	$ 9,279,190	$ 6,314,688	$ 3,598,066	$ 1,631,123	$ -	$ -
215	$ 29,640,000	$ 25,500,000	$ 21,360,000	$ 17,040,000	$ 12,840,000	$ 8,700,000	$ 4,860,000	$ 2,160,000	$ -	$ -
216										
217	$ 18,832,087	$ 16,237,555	$ 13,667,444	$ 11,007,884	$ 8,348,230	$ 5,703,859	$ 3,264,649	$ 1,522,659	$ -	$ -
218	$ 102,244,543	$ 88,326,408	$ 74,719,549	$ 60,288,499	$ 46,104,662	$ 32,113,414	$ 18,552,415	$ 9,237,230	$ -	$ -
219	$ 17,455,618	$ 15,046,563	$ 12,624,333	$ 10,177,257	$ 7,679,930	$ 5,188,206	$ 2,918,075	$ 1,319,773	$ -	$ -
220	$ 50,555,411	$ 43,273,706	$ 35,696,808	$ 28,449,195	$ 20,850,918	$ 13,222,950	$ 7,041,028	$ 2,303,000	$ -	$ -
221	$ 9,626,100	$ 8,300,550	$ 6,978,300	$ 5,625,150	$ 4,255,950	$ 2,892,300	$ 1,640,250	$ 750,600	$ -	$ -
222										
223	$ 24,368,398	$ 21,021,626	$ 17,672,518	$ 14,219,506	$ 10,769,256	$ 7,320,722	$ 4,171,342	$ 1,898,870	$ -	$ -
224	$ 32,269,814	$ 27,758,652	$ 23,271,475	$ 18,715,409	$ 14,098,937	$ 9,532,574	$ 5,378,306	$ 2,477,578	$ -	$ -
225										
226	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -
227										
228	$ 34,000,000	$ 33,000,000	$ 33,000,000	$ 33,000,000	$ 33,000,000	$ 33,000,000	$ 33,000,000	$ 33,000,000	$ -	$ -
229	$ 6,000,000	$ 6,000,000	$ 6,000,000	$ 6,000,000	$ 6,000,000	$ 6,000,000	$ 6,000,000	$ 6,000,000	$ -	$ -
230										
231										
232	$ 345,161,099	$ 302,100,557	$ 259,982,879	$ 216,717,672	$ 173,227,071	$ 129,988,712	$ 90,424,130	$ 62,300,834	$ -	$ -
233	$ 1,259,279,229	$ 1,146,265,078	$ 1,025,915,578	$ 889,394,710	$ 739,348,706	$ 576,995,642	$ 417,430,879	$ 299,107,588	$ -	$ -
234	$ 122,065,190	$ 103,524,184	$ 86,328,728	$ 69,730,893	$ 54,009,103	$ 39,271,469	$ 26,471,353	$ 17,672,825	$ -	$ -

TOTAL O&S COST (DSW)

	A	B	C	D	E	F	G	H	I	J	K
4	FY Year	2002	2003	2004	2005	2006	2007	2008	2009	2010	2011
5	Year	0	1	2	3	4	5	6	7	8	9
6	Training										
7	Aircraft Transition	$ -	$ -	$ -	$ 2,670,000	$ 3,600,000	$ 4,440,000	$ 3,600,000	$ 6,390,000	$ 9,990,000	$ 9,090,000
8	Instructor Pilots	$ -	$ -	$ -	$ 1,000,000	$ 600,000	$ 675,000	$ 575,000	$ 950,000	$ 1,325,000	$ 1,250,000
9	Maintenance Test Pilots	$ -	$ -	$ -	$ 200,000	$ 325,000	$ 375,000	$ 275,000	$ 675,000	$ 975,000	$ 950,000
10	Aircraft Maintainers (67C)	$ -	$ -	$ -	$ 718,200	$ 1,401,300	$ 1,776,600	$ 1,314,000	$ 2,677,500	$ 4,168,800	$ 3,789,000
11	Aircraft Repairers (68C)	$ -	$ -	$ -	$ 712,400	$ 1,419,600	$ 1,762,800	$ 1,378,000	$ 2,314,000	$ 4,058,600	$ 3,702,400
12	Structure Repair (68G)	$ -	$ -	$ -	$ 141,700	$ 327,600	$ 427,700	$ 305,500	$ 486,200	$ 872,300	$ 806,000
13	Total Training	$ -	$ -	$ -	$ 5,442,300	$ 7,673,500	$ 9,457,100	$ 7,447,500	$ 13,492,700	$ 21,389,700	$ 19,587,400
14	Manning										
15	Operation	$ -	$ -	$ -	$ -	$ 6,647,357	$ 13,633,757	$ 20,689,856	$ 25,774,616	$ 33,548,929	$ 48,723,582
16	Maintenance	$ -	$ -	$ -	$ -	$ 3,705,300	$ 6,183,181	$ 8,685,748	$ 10,703,414	$ 17,982,461	$ 28,179,012
17	Support	$ -	$ -	$ -	$ -	$ 4,889,003	$ 10,925,021	$ 17,021,277	$ 19,191,091	$ 28,409,176	$ 43,950,774
18	Total Manning	$ -	$ -	$ -	$ -	$ 15,241,660	$ 30,741,959	$ 46,396,880	$ 55,669,121	$ 79,940,566	$ 120,853,368
19	Operation										
20	POL	$ -	$ -	$ -	$ -	$ 577,499	$ 1,268,721	$ 2,357,103	$ 3,865,649	$ 5,401,537	$ 7,291,594
21	Ammunition/Missile Costs	$ -	$ -	$ -	$ -	$ 1,320,000	$ 2,880,000	$ 5,400,000	$ 8,880,000	$ 12,360,000	$ 16,560,000
22	Total Operation	$ -	$ -	$ -	$ -	$ 1,897,499	$ 4,148,721	$ 7,757,103	$ 12,745,649	$ 17,761,537	$ 23,851,594
23	Maintenance										
24	Consumables	$ -	$ -	$ -	$ -	$ -	$ 2,445,088	$ 3,949,479	$ 7,158,306	$ 11,493,954	$ 21,391,236
25	Repairables	$ -	$ -	$ -	$ -	$ -	$ 7,763,234	$ 16,523,555	$ 30,078,488	$ 48,429,718	$ 89,305,621
26	Transportation	$ -	$ -	$ -	$ -	$ -	$ 496,500	$ 1,051,500	$ 1,903,800	$ 3,056,100	$ 5,674,200
27	Depot Repair	$ -	$ -	$ -	$ -	$ -	$ 2,874,784	$ 6,098,051	$ 11,089,389	$ 17,840,416	$ 33,177,502
28	Total Maintenance	$ -	$ -	$ -	$ -	$ -	$ 13,579,607	$ 27,622,586	$ 50,229,983	$ 80,820,188	$ 149,548,559
29	Contractor Logistics Support										
30	CLS	$ -	$ -	$ -	$ 138,500,000	$ 77,750,000	$ 165,000,000	$ 147,250,000	$ 165,500,000	$ 83,500,000	$ 34,500,000
31	Total CLS	$ -	$ -	$ -	$ 138,500,000	$ 77,750,000	$ 165,000,000	$ 147,250,000	$ 165,500,000	$ 83,500,000	$ 34,500,000
32	System Support										
33	Software Support	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -
34	Systems Engineering	$ 500,000	$ 500,000	$ 500,000	$ 121,000	$ 124,000	$ 127,000	$ 130,000	$ 133,000	$ 136,000	$ 139,000
35	Total System Support	$ 500,000	$ 500,000	$ 500,000	$ 121,000	$ 124,000	$ 127,000	$ 130,000	$ 133,000	$ 136,000	$ 139,000
36											
37	Total (Constant $)	$ 500,000	$ 500,000	$ 500,000	$ 144,063,300	$ 102,686,659	$ 223,054,387	$ 236,604,069	$ 297,770,453	$ 283,547,991	$ 348,479,922
38	Inflation (Then Year $)	$ 500,000	$ 520,000	$ 540,800	$ 162,051,620	$ 120,128,867	$ 271,379,767	$ 299,379,629	$ 391,845,603	$ 388,055,005	$ 495,995,589
39	PV (FY 2002 $)	$ 500,000	$ 484,496	$ 469,473	$ 131,073,310	$ 90,530,566	$ 190,551,461	$ 195,859,222	$ 238,849,162	$ 220,388,534	$ 262,458,405
40	Comanche O&S NPV	$ 15,875,193,587									
41											

42		Cost Breakdown	
43		NPV	% of O&S Costs
44	Training	$ 747,160,891	4.7%
45	Manning	$ 7,443,679,135	46.9%
46	Operation	$ 987,477,374	6.2%
47	Maintenance	$ 5,432,915,832	34.2%
48	Contractor Logistics Support	$ 681,042,802	4.3%
49	System Sustainment	$ 582,917,554	3.7%
50	Total	$ 15,875,193,587	

	L	M	N	O	P	Q	R	S	T	U	V	W
4	2012	2013	2014	2015	2016	2017	2018	2019	2020	2021	2022	2023
5	10	11	12	13	14	15	16	17	18	19	20	21
6												
7	$ 12,840,000	$ 12,360,000	$ 14,400,000	$ 24,540,000	$ 28,590,000	$ 30,450,000	$ 27,570,000	$ 29,310,000	$ 29,010,000	$ 36,270,000	$ 37,200,000	$ 31,830,000
8	$ 1,650,000	$ 1,625,000	$ 1,650,000	$ 1,925,000	$ 2,100,000	$ 2,300,000	$ 2,500,000	$ 2,700,000	$ 2,675,000	$ 2,750,000	$ 2,800,000	$ 2,575,000
9	$ 1,300,000	$ 1,325,000	$ 1,450,000	$ 2,700,000	$ 3,175,000	$ 3,400,000	$ 3,075,000	$ 3,275,000	$ 3,250,000	$ 4,075,000	$ 4,200,000	$ 3,575,000
10	$ 5,401,800	$ 5,428,800	$ 5,761,800	$ 7,577,100	$ 8,460,000	$ 9,246,600	$ 9,435,600	$ 10,286,100	$ 10,092,600	$ 11,153,700	$ 11,369,700	$ 10,214,100
11	$ 5,291,000	$ 4,622,800	$ 5,387,200	$ 6,671,600	$ 7,397,000	$ 8,112,000	$ 8,580,000	$ 9,115,600	$ 9,175,400	$ 9,846,200	$ 10,010,000	$ 9,092,200
12	$ 1,172,600	$ 986,700	$ 1,214,200	$ 1,701,700	$ 1,907,100	$ 2,024,100	$ 1,986,400	$ 2,086,500	$ 2,122,900	$ 2,466,100	$ 2,505,100	$ 2,186,600
13	$ 27,655,400	$ 26,348,300	$ 29,863,200	$ 45,115,400	$ 51,629,100	$ 55,532,700	$ 53,147,000	$ 56,773,200	$ 56,325,900	$ 66,561,000	$ 68,084,800	$ 59,472,900
14												
15	$ 56,920,404	$ 72,362,359	$ 80,290,235	$ 92,219,639	$ 122,873,170	$ 153,830,932	$ 180,479,711	$ 193,735,774	$ 206,879,359	$ 216,232,096	$ 239,534,403	$ 258,597,876
16	$ 35,955,622	$ 46,343,357	$ 53,605,067	$ 59,300,912	$ 79,776,275	$ 100,454,910	$ 119,448,984	$ 131,906,741	$ 144,134,590	$ 152,841,539	$ 168,457,062	$ 181,239,805
17	$ 53,483,705	$ 69,305,057	$ 78,856,930	$ 90,619,494	$ 127,035,469	$ 163,813,337	$ 195,375,737	$ 210,818,719	$ 226,307,593	$ 237,179,882	$ 264,833,880	$ 287,438,402
18	$ 146,359,731	$ 188,010,773	$ 212,752,232	$ 242,140,045	$ 329,684,914	$ 418,099,179	$ 495,304,432	$ 536,461,234	$ 577,321,543	$ 606,253,516	$ 672,825,345	$ 727,276,083
19												
20	$ 9,255,093	$ 11,345,243	$ 13,497,948	$ 15,705,678	$ 17,996,318	$ 20,372,301	$ 22,864,295	$ 25,447,820	$ 28,076,693	$ 30,551,428	$ 32,534,580	$ 34,304,925
21	$ 20,760,000	$ 25,080,000	$ 29,280,000	$ 33,420,000	$ 37,560,000	$ 41,700,000	$ 46,020,000	$ 50,220,000	$ 54,360,000	$ 58,200,000	$ 60,900,000	$ 63,060,000
22	$ 30,015,093	$ 36,425,243	$ 42,777,948	$ 49,125,678	$ 55,556,318	$ 62,072,301	$ 68,884,295	$ 75,667,820	$ 82,436,693	$ 88,751,428	$ 93,434,580	$ 97,364,925
23												
24	$ 26,431,866	$ 31,603,976	$ 36,676,222	$ 41,670,260	$ 46,664,522	$ 51,665,049	$ 56,766,662	$ 61,840,353	$ 66,793,983	$ 71,121,396	$ 74,004,717	$ 76,356,783
25	$ 110,704,806	$ 132,631,552	$ 154,133,518	$ 175,302,837	$ 196,465,827	$ 217,663,515	$ 239,337,906	$ 260,856,236	$ 281,889,156	$ 300,466,509	$ 313,093,407	$ 323,257,702
26	$ 7,011,300	$ 8,382,600	$ 9,726,300	$ 11,049,150	$ 12,371,250	$ 13,695,450	$ 15,046,800	$ 16,390,650	$ 17,703,450	$ 18,849,900	$ 19,614,000	$ 20,237,100
27	$ 41,075,190	$ 49,180,032	$ 57,143,800	$ 64,985,731	$ 72,824,945	$ 80,671,341	$ 88,676,646	$ 96,637,906	$ 104,420,078	$ 111,241,565	$ 115,836,384	$ 119,576,774
28	$ 185,223,162	$ 221,798,160	$ 257,679,840	$ 293,007,978	$ 328,326,544	$ 363,695,355	$ 399,828,015	$ 435,725,145	$ 470,806,667	$ 501,679,370	$ 522,548,507	$ 539,428,359
29												
30	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -
31	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -
32												
33	$ -	$ -	$ -	$ -	$ -	$ 75,000,000	$ 65,000,000	$ 35,000,000	$ 35,000,000	$ 70,000,000	$ 35,000,000	$ 35,000,000
34	$ 142,000	$ 145,000	$ 148,000	$ 151,000	$ 154,000	$ 10,000,000	$ 10,000,000	$ 10,000,000	$ 10,000,000	$ 9,000,000	$ 9,000,000	$ 9,000,000
35	$ 142,000	$ 145,000	$ 148,000	$ 151,000	$ 154,000	$ 85,000,000	$ 75,000,000	$ 45,000,000	$ 45,000,000	$ 79,000,000	$ 44,000,000	$ 44,000,000
36												
37	$ 389,395,387	$ 472,727,476	$ 543,221,220	$ 629,540,101	$ 765,350,876	$ 984,399,535	$ 1,092,163,742	$ 1,149,627,398	$ 1,231,890,803	$ 1,342,245,314	$ 1,400,893,233	$ 1,467,542,268
38	$ 576,400,296	$ 727,742,231	$ 869,714,675	$ 1,048,230,544	$ 1,325,340,087	$ 1,772,847,949	$ 2,045,602,206	$ 2,239,359,777	$ 2,495,584,734	$ 2,827,908,434	$ 3,069,529,584	$ 3,344,188,459
39	$ 284,180,209	$ 334,298,306	$ 372,237,703	$ 418,010,638	$ 492,430,361	$ 613,728,004	$ 659,800,436	$ 672,980,145	$ 698,775,487	$ 737,764,320	$ 746,124,141	$ 757,385,481

TOTAL O&S COST (DSW) cont.

	X	Y	Z	AA	AB	AC	AD	AE	AF	AG	AH	AI
4	2024	2025	2026	2027	2028	2029	2030	2031	2032	2033	2034	2035
5	22	23	24	25	26	27	28	29	30	31	32	33
6												
7	$ 31,830,000	$ 31,830,000	$ 31,830,000	$ 31,830,000	$ 31,320,000	$ 30,510,000	$ 29,340,000	$ 28,260,000	$ 26,940,000	$ 25,440,000	$ 24,420,000	$ 23,040,000
8	$ 2,575,000	$ 2,575,000	$ 2,575,000	$ 2,575,000	$ 2,525,000	$ 2,450,000	$ 2,350,000	$ 2,200,000	$ 2,075,000	$ 1,900,000	$ 1,775,000	$ 1,625,000
9	$ 3,575,000	$ 3,575,000	$ 3,575,000	$ 3,575,000	$ 3,525,000	$ 3,425,000	$ 3,350,000	$ 3,225,000	$ 3,100,000	$ 2,925,000	$ 2,800,000	$ 2,650,000
10	$ 10,214,100	$ 10,214,100	$ 10,214,100	$ 10,214,100	$ 10,002,600	$ 9,627,300	$ 9,190,800	$ 8,673,300	$ 8,086,500	$ 7,453,800	$ 7,017,300	$ 6,349,500
11	$ 9,092,200	$ 9,092,200	$ 9,092,200	$ 9,092,200	$ 8,871,200	$ 8,499,400	$ 8,047,000	$ 7,657,000	$ 7,064,200	$ 6,396,000	$ 5,954,000	$ 5,413,200
12	$ 2,186,600	$ 2,186,600	$ 2,186,600	$ 2,186,600	$ 2,147,600	$ 2,067,000	$ 1,944,800	$ 1,886,300	$ 1,744,600	$ 1,605,500	$ 1,505,400	$ 1,385,800
13	$ 59,472,900	$ 59,472,900	$ 59,472,900	$ 59,472,900	$ 58,391,400	$ 56,578,700	$ 54,222,600	$ 51,901,600	$ 49,010,300	$ 45,720,300	$ 43,471,700	$ 40,463,500
14												
15	$ 259,890,865	$ 261,190,320	$ 262,496,271	$ 263,808,753	$ 260,820,854	$ 254,365,421	$ 242,307,566	$ 235,029,454	$ 223,934,358	$ 211,806,935	$ 203,990,415	$ 192,814,360
16	$ 182,146,004	$ 183,056,735	$ 183,972,018	$ 184,891,878	$ 181,681,326	$ 179,845,162	$ 175,793,861	$ 168,649,456	$ 162,488,424	$ 150,582,589	$ 142,814,257	$ 136,797,261
17	$ 288,875,594	$ 290,319,972	$ 291,771,572	$ 293,230,430	$ 289,653,165	$ 284,392,683	$ 276,757,452	$ 268,011,845	$ 257,396,976	$ 243,171,653	$ 233,994,265	$ 223,140,792
18	$ 730,912,464	$ 734,567,026	$ 738,239,861	$ 741,931,060	$ 732,155,345	$ 718,603,265	$ 694,858,879	$ 671,690,755	$ 643,819,759	$ 605,561,177	$ 580,798,937	$ 552,752,413
19												
20	$ 34,991,024	$ 35,690,844	$ 35,546,528	$ 35,247,501	$ 34,372,878	$ 32,888,767	$ 31,379,176	$ 29,358,762	$ 27,244,979	$ 24,959,077	$ 22,596,622	$ 20,169,128
21	$ 63,060,000	$ 63,060,000	$ 61,740,000	$ 60,180,000	$ 57,660,000	$ 54,180,000	$ 50,700,000	$ 46,500,000	$ 42,300,000	$ 37,980,000	$ 33,780,000	$ 29,640,000
22	$ 98,051,024	$ 98,750,844	$ 97,286,528	$ 95,427,501	$ 92,032,878	$ 87,068,767	$ 82,079,176	$ 75,858,762	$ 69,544,979	$ 62,939,077	$ 56,376,622	$ 49,809,128
23												
24	$ 76,042,738	$ 76,183,604	$ 74,493,990	$ 72,683,802	$ 69,720,364	$ 65,512,860	$ 61,471,653	$ 56,483,200	$ 51,506,782	$ 46,365,210	$ 41,283,905	$ 36,287,704
25	$ 322,422,389	$ 322,611,213	$ 315,439,018	$ 307,571,872	$ 294,813,943	$ 277,014,024	$ 259,681,759	$ 238,493,715	$ 217,320,161	$ 195,491,906	$ 173,966,041	$ 152,799,954
26	$ 20,157,300	$ 20,189,100	$ 19,741,800	$ 19,264,200	$ 18,479,700	$ 17,367,300	$ 16,296,300	$ 14,974,800	$ 13,656,300	$ 12,294,300	$ 10,948,650	$ 9,626,100
27	$ 119,187,553	$ 119,405,680	$ 116,760,211	$ 113,867,406	$ 109,167,856	$ 102,547,264	$ 96,167,368	$ 88,330,224	$ 80,515,650	$ 72,449,459	$ 64,479,853	$ 56,638,213
28	$ 537,809,979	$ 538,389,597	$ 526,435,020	$ 513,387,281	$ 492,181,863	$ 462,441,447	$ 433,617,080	$ 398,281,938	$ 362,998,894	$ 326,600,875	$ 290,678,448	$ 255,351,971
29												
30	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -
31	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -
32												
33	$ 35,000,000	$ 70,000,000	$ 35,000,000	$ 35,000,000	$ 35,000,000	$ 35,000,000	$ 70,000,000	$ 35,000,000	$ 35,000,000	$ 35,000,000	$ 60,000,000	$ 34,000,000
34	$ 9,000,000	$ 8,000,000	$ 8,000,000	$ 8,000,000	$ 8,000,000	$ 7,000,000	$ 7,000,000	$ 7,000,000	$ 7,000,000	$ 6,000,000	$ 6,000,000	$ 6,000,000
35	$ 44,000,000	$ 78,000,000	$ 43,000,000	$ 43,000,000	$ 43,000,000	$ 42,000,000	$ 77,000,000	$ 42,000,000	$ 42,000,000	$ 41,000,000	$ 66,000,000	$ 40,000,000
36												
37	$ 1,470,246,366	$ 1,509,180,367	$ 1,464,434,308	$ 1,453,218,742	$ 1,417,761,486	$ 1,366,692,179	$ 1,341,777,735	$ 1,239,733,055	$ 1,167,373,932	$ 1,081,821,429	$ 1,037,325,706	$ 938,377,012
38	$ 3,484,364,492	$ 3,719,700,309	$ 3,753,790,562	$ 3,874,043,321	$ 3,930,700,881	$ 3,940,677,283	$ 4,023,593,346	$ 3,866,295,291	$ 3,786,257,703	$ 3,649,128,007	$ 3,638,999,518	$ 3,423,556,952
39	$ 735,252,948	$ 731,321,109	$ 687,633,711	$ 661,208,698	$ 625,073,439	$ 583,873,658	$ 555,455,225	$ 497,298,283	$ 453,752,543	$ 407,459,984	$ 378,586,242	$ 331,854,224

	AJ	AK	AL	AM	AN	AO	AP	AQ	AR	AS
4	2036	2037	2038	2039	2040	2041	2042	2043	2044	2045
5	34	35	36	37	38	39	40	41	42	43
6										
7	$ 21,060,000	$ 17,040,000	$ 12,960,000	$ 9,600,000	$ 8,580,000	$ 7,020,000	$ 5,520,000	$ 2,610,000	$ 330,000	$ -
8	$ 1,450,000	$ 1,300,000	$ 1,125,000	$ 950,000	$ 850,000	$ 650,000	$ 475,000	$ 350,000	$ 275,000	$ -
9	$ 2,475,000	$ 1,975,000	$ 1,500,000	$ 1,125,000	$ 1,000,000	$ 800,000	$ 625,000	$ 300,000	$ -	$ -
10	$ 5,541,300	$ 4,658,400	$ 3,789,000	$ 2,933,100	$ 2,511,900	$ 1,782,900	$ 1,150,200	$ 519,300	$ -	$ -
11	$ 4,768,400	$ 4,071,600	$ 3,369,600	$ 2,649,400	$ 2,207,400	$ 1,591,200	$ 923,000	$ 423,800	$ -	$ -
12	$ 1,244,100	$ 1,038,700	$ 830,700	$ 647,400	$ 547,300	$ 427,700	$ 288,600	$ 144,300	$ -	$ -
13	$ 36,538,800	$ 30,083,700	$ 23,574,300	$ 17,904,900	$ 15,696,600	$ 12,271,800	$ 8,981,800	$ 4,347,400	$ 605,000	$ -
14										
15	$ 176,755,804	$ 144,113,299	$ 111,139,951	$ 82,958,396	$ 74,228,017	$ 61,079,897	$ 47,530,019	$ 23,092,863	$ 3,369,783	$ -
16	$ 127,531,449	$ 105,762,097	$ 83,771,863	$ 63,657,057	$ 55,195,242	$ 42,625,529	$ 29,536,476	$ 13,192,959	$ -	$ -
17	$ 206,496,473	$ 167,595,056	$ 128,299,463	$ 94,802,946	$ 84,567,994	$ 68,962,164	$ 53,082,487	$ 23,957,191	$ 446,847	$ -
18	$ 510,783,727	$ 417,470,453	$ 323,211,277	$ 241,418,400	$ 213,991,253	$ 172,667,589	$ 130,148,982	$ 60,243,013	$ 3,816,631	$ -
19										
20	$ 17,635,497	$ 14,992,452	$ 12,194,773	$ 9,279,190	$ 6,314,688	$ 3,598,066	$ 1,631,123	$ -	$ -	$ -
21	$ 25,500,000	$ 21,360,000	$ 17,040,000	$ 12,840,000	$ 8,700,000	$ 4,860,000	$ 2,160,000	$ -	$ -	$ -
22	$ 43,135,497	$ 36,352,452	$ 29,234,773	$ 22,119,190	$ 15,014,688	$ 8,458,066	$ 3,791,123	$ -	$ -	$ -
23										
24	$ 31,284,118	$ 26,291,777	$ 21,185,141	$ 16,028,159	$ 10,892,065	$ 6,182,724	$ 2,842,432	$ -	$ -	$ -
25	$ 131,600,114	$ 110,416,357	$ 88,737,693	$ 66,955,579	$ 45,336,364	$ 25,593,443	$ 11,540,231	$ -	$ -	$ -
26	$ 8,300,550	$ 6,978,300	$ 5,625,150	$ 4,255,950	$ 2,892,300	$ 1,640,250	$ 750,600	$ -	$ -	$ -
27	$ 48,780,278	$ 40,943,994	$ 32,934,915	$ 24,868,193	$ 16,853,295	$ 9,549,648	$ 4,376,448	$ -	$ -	$ -
28	$ 219,965,060	$ 184,630,427	$ 148,482,899	$ 112,107,882	$ 75,974,024	$ 42,966,065	$ 19,509,711	$ -	$ -	$ -
29										
30	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -
31	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -
32										
33	$ 33,000,000	$ 33,000,000	$ 33,000,000	$ 33,000,000	$ 33,000,000	$ 33,000,000	$ 33,000,000	$ -	$ -	$ -
34	$ 6,000,000	$ 6,000,000	$ 6,000,000	$ 6,000,000	$ 6,000,000	$ 6,000,000	$ 6,000,000	$ -	$ -	$ -
35	$ 39,000,000	$ 39,000,000	$ 39,000,000	$ 39,000,000	$ 39,000,000	$ 39,000,000	$ 39,000,000	$ -	$ -	$ -
36										
37	$ 849,423,083	$ 707,537,032	$ 563,503,249	$ 432,550,371	$ 359,676,565	$ 275,363,519	$ 201,431,616	$ 64,590,413	$ 4,421,631	$ -
38	$ 3,222,979,885	$ 2,792,004,095	$ 2,312,579,327	$ 1,846,163,850	$ 1,596,537,174	$ 1,271,178,786	$ 967,077,343	$ 322,503,904	$ 22,960,573	$ -
39	$ 291,081,330	$ 234,941,518	$ 181,312,323	$ 134,861,470	$ 108,663,489	$ 80,611,724	$ 57,139,935	$ 17,754,174	$ 1,177,701	$ -

Ao (DSW)

MTOE Aircraft (Peacetime)

MTBEMA % Change	MTBEMA	Ao	MTTRe % Change	MTTRe	Ao
100%	9.56	0.940	100%	0.00	0.886
95%	9.32	0.939	95%	0.06	0.886
90%	9.08	0.937	90%	0.11	0.886
85%	8.84	0.936	85%	0.17	0.886
80%	8.60	0.934	80%	0.22	0.885
75%	8.37	0.932	75%	0.28	0.885
70%	8.13	0.930	70%	0.34	0.885
65%	7.89	0.928	65%	0.39	0.884
60%	7.65	0.925	60%	0.45	0.884
55%	7.41	0.923	55%	0.50	0.884
50%	7.17	0.920	50%	0.56	0.884
45%	6.93	0.918	45%	0.62	0.883
40%	6.69	0.915	40%	0.67	0.883
35%	6.45	0.912	35%	0.73	0.883
30%	6.21	0.908	30%	0.78	0.882
25%	5.98	0.905	25%	0.84	0.882
20%	5.74	0.901	20%	0.90	0.882
15%	5.50	0.896	15%	0.95	0.882
10%	5.26	0.892	10%	1.01	0.881
5%	5.02	0.886	5%	1.06	0.881
0%	4.78	0.881	0%	1.12	0.881
-5%	4.54	0.874	-5%	1.18	0.880
-10%	4.30	0.867	-10%	1.23	0.880
-15%	4.06	0.860	-15%	1.29	0.880
-20%	3.82	0.851	-20%	1.34	0.880
-25%	3.59	0.841	-25%	1.40	0.879
-30%	3.35	0.830	-30%	1.46	0.879
-35%	3.11	0.817	-35%	1.51	0.879
-40%	2.87	0.801	-40%	1.57	0.878
-45%	2.63	0.783	-45%	1.62	0.878
-50%	2.39	0.761	-50%	1.68	0.878
-55%	2.15	0.735	-55%	1.74	0.878
-60%	1.91	0.702	-60%	1.79	0.877
-65%	1.67	0.659	-65%	1.85	0.877
-70%	1.43	0.602	-70%	1.90	0.877
-75%	1.20	0.523	-75%	1.96	0.876
-80%	0.96	0.404	-80%	2.02	0.876
-85%	0.72	0.205	-85%	2.07	0.876
-90%	0.48	-0.193	-90%	2.13	0.875
-95%	0.24	-1.385	-95%	2.18	0.875

TDA Aircraft (Peacetime)

MTBEMA % Change	MTBEMA	Ao	MTTRe % Change	MTTRe	Ao
100%	9.56	0.901	100%	0.00	0.811
95%	9.32	0.898	95%	0.06	0.810
90%	9.08	0.895	90%	0.11	0.810
85%	8.84	0.893	85%	0.17	0.809
80%	8.60	0.890	80%	0.22	0.809
75%	8.37	0.886	75%	0.28	0.808
70%	8.13	0.883	70%	0.34	0.808
65%	7.89	0.880	65%	0.39	0.807
60%	7.65	0.876	60%	0.45	0.807
55%	7.41	0.872	55%	0.50	0.806
50%	7.17	0.867	50%	0.56	0.806
45%	6.93	0.863	45%	0.62	0.805
40%	6.69	0.858	40%	0.67	0.805
35%	6.45	0.853	35%	0.73	0.805
30%	6.21	0.847	30%	0.78	0.804
25%	5.98	0.841	25%	0.84	0.804
20%	5.74	0.834	20%	0.90	0.803
15%	5.50	0.827	15%	0.95	0.803
10%	5.26	0.819	10%	1.01	0.802
5%	5.02	0.811	5%	1.06	0.802
0%	4.78	0.801	0%	1.12	0.801
-5%	4.54	0.791	-5%	1.18	0.801
-10%	4.30	0.779	-10%	1.23	0.800
-15%	4.06	0.766	-15%	1.29	0.800
-20%	3.82	0.752	-20%	1.34	0.799
-25%	3.59	0.735	-25%	1.40	0.799
-30%	3.35	0.716	-30%	1.46	0.798
-35%	3.11	0.694	-35%	1.51	0.798
-40%	2.87	0.669	-40%	1.57	0.797
-45%	2.63	0.639	-45%	1.62	0.797
-50%	2.39	0.602	-50%	1.68	0.796
-55%	2.15	0.558	-55%	1.74	0.796
-60%	1.91	0.503	-60%	1.79	0.795
-65%	1.67	0.432	-65%	1.85	0.795
-70%	1.43	0.337	-70%	1.90	0.794
-75%	1.20	0.205	-75%	1.96	0.794
-80%	0.96	0.006	-80%	2.02	0.793
-85%	0.72	-0.325	-85%	2.07	0.793
-90%	0.48	-0.988	-90%	2.13	0.792
-95%	0.24	-2.975	-95%	2.18	0.792

MTOE Aircraft (Wartime)

MTBEMA % Change	MTBEMA	Ao	MTTRe % Change	MTTRe	Ao
100%	9.56	0.882	100%	0.00	0.822
95%	9.32	0.878	95%	0.06	0.819
90%	9.08	0.875	90%	0.11	0.816
85%	8.84	0.872	85%	0.17	0.813
80%	8.60	0.868	80%	0.22	0.810
75%	8.37	0.865	75%	0.28	0.807
70%	8.13	0.861	70%	0.34	0.804
65%	7.89	0.856	65%	0.39	0.801
60%	7.65	0.852	60%	0.45	0.798
55%	7.41	0.847	55%	0.50	0.795
50%	7.17	0.842	50%	0.56	0.792
45%	6.93	0.837	45%	0.62	0.789
40%	6.69	0.831	40%	0.67	0.786
35%	6.45	0.824	35%	0.73	0.783
30%	6.21	0.818	30%	0.78	0.780
25%	5.98	0.810	25%	0.84	0.778
20%	5.74	0.803	20%	0.90	0.775
15%	5.50	0.794	15%	0.95	0.772
10%	5.26	0.785	10%	1.01	0.769
5%	5.02	0.774	5%	1.06	0.766
0%	4.78	0.763	0%	1.12	0.763
-5%	4.54	0.751	-5%	1.18	0.760
-10%	4.30	0.737	-10%	1.23	0.757
-15%	4.06	0.721	-15%	1.29	0.754
-20%	3.82	0.704	-20%	1.34	0.751
-25%	3.59	0.684	-25%	1.40	0.748
-30%	3.35	0.662	-30%	1.46	0.745
-35%	3.11	0.635	-35%	1.51	0.742
-40%	2.87	0.605	-40%	1.57	0.739
-45%	2.63	0.569	-45%	1.62	0.736
-50%	2.39	0.526	-50%	1.68	0.733
-55%	2.15	0.473	-55%	1.74	0.731
-60%	1.91	0.408	-60%	1.79	0.728
-65%	1.67	0.323	-65%	1.85	0.725
-70%	1.43	0.210	-70%	1.90	0.722
-75%	1.20	0.052	-75%	1.96	0.719
-80%	0.96	-0.165	-80%	2.02	0.716
-85%	0.72	-0.580	-85%	2.07	0.713
-90%	0.48	-1.369	-90%	2.13	0.710
-95%	0.24	-3.739	-95%	2.18	0.707

APPENDIX C: COMANCHE PROGRAM OFFICE O&S COST ESTIMATE

	Prior	FY 2005	FY 2006	FY 2007	FY 2008	FY 2009	FY 2010	FY 2011	FY 2012	FY 2013	FY 2014	FY 2015	FY 2016	To Compl	Total
Training															$608,700,000
Training	$0	$0	$0	$200,000	$700,000	$1,600,000	$2,800,000	$4,200,000	$5,600,000	$8,900,000	$8,400,000	$10,300,000	$12,100,000	$555,900,000	$608,700,000
Manning															$7,507,600,000
Crew	$0	$0	$0	$800,000	$2,600,000	$6,200,000	$11,200,000	$16,900,000	$22,500,000	$27,600,000	$33,600,000	$40,900,000	$48,200,000	$2,215,600,000	$2,425,900,000
Maintenance (MTOE)	$0	$0	$0	$400,000	$1,900,000	$4,500,000	$8,100,000	$12,200,000	$16,300,000	$20,000,000	$24,300,000	$29,600,000	$34,800,000	$1,601,100,000	$1,753,200,000
Support	$0	$0	$0	$500,000	$2,400,000	$5,600,000	$10,100,000	$15,300,000	$20,300,000	$24,900,000	$30,400,000	$36,900,000	$43,500,000	$1,999,400,000	$2,189,300,000
Replacement	$0	$0	$0	$300,000	$1,100,000	$2,700,000	$4,800,000	$7,300,000	$9,700,000	$11,900,000	$14,500,000	$17,000,000	$20,700,000	$952,100,000	$1,042,700,000
Other	$25,300,000	$2,400,000	$2,400,000	$100,000	$100,000	$100,000	$3,800,000	$3,800,000	$3,800,000	$3,800,000	$3,800,000	$3,800,000	$3,800,000	$39,500,000	$96,500,000
Operation															$1,551,500,000
POL	$0	$0	$0	$100,000	$400,000	$100,000	$1,800,000	$2,800,000	$3,700,000	$4,500,000	$5,600,000	$6,800,000	$8,000,000	$370,800,000	$404,600,000
Training Ammo	$0	$0	$0	$600,000	$1,900,000	$3,600,000	$6,100,000	$8,800,000	$11,900,000	$15,200,000	$18,400,000	$21,500,000	$24,700,000	$1,034,200,000	$1,146,900,000
Maintenance															$5,952,100,000
Consumables	$0	$0	$0	$0	$0	$0	$2,200,000	$3,000,000	$7,700,000	$9,000,000	$10,600,000	$12,600,000	$14,500,000	$595,900,000	$655,500,000
DLRs	$0	$0	$0	$0	$0	$0	$15,100,000	$21,400,000	$54,300,000	$64,700,000	$77,600,000	$92,900,000	$107,900,000	$4,614,500,000	$5,048,400,000
Transportation	$0	$0	$0	$0	$0	$100,000	$100,000	$100,000	$100,000	$1,400,000	$2,400,000	$100,000	$100,000	$4,400,000	$8,800,000
End Item Maint	$0	$0	$0	$0	$0	$0	$100,000	$100,000	$2,300,000	$2,800,000	$3,400,000	$4,100,000	$4,900,000	$221,700,000	$239,400,000
CLS															$628,700,000
CLS	$0	$114,800,000	$82,800,000	$129,500,000	$112,900,000	$123,400,000	$60,900,000	$24,400,000	$0	$0	$0	$0	$0	$0	$628,700,000
System Sustainment															$702,500,000
Software (PDSS)	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$508,700,000	$508,700,000
System Engineering	$1,900,000	$100,000	$100,000	$100,000	$100,000	$100,000	$100,000	$100,000	$100,000	$100,000	$100,000	$100,000	$100,000	$190,700,000	$193,800,000
Total (FY 1999 $)	$16,951,100,000														

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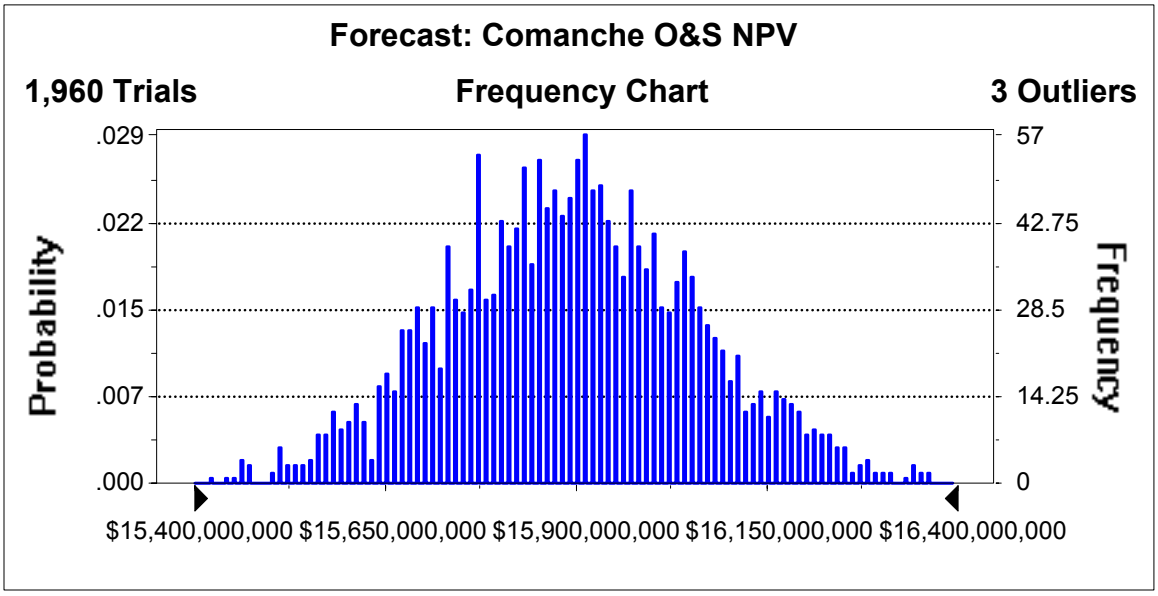
APPENDIX D: COMANCHE MODEL RESULTS



Simulation Results for Comanche O&S Costs (Mean: $15,896,117,534)

Percentile	Value
0%	$15,359,175,724
10%	$15,685,551,403
20%	$15,754,959,219
30%	$15,807,612,738
40%	$15,854,674,327
50%	$15,894,595,584
60%	$15,934,405,984
70%	$15,980,356,862
80%	$16,037,882,306
90%	$16,107,952,585
100%	$16,442,982,859

O&S Cost Percentiles when Predicted R&M levels are reached by 4th Year of Aircraft Service

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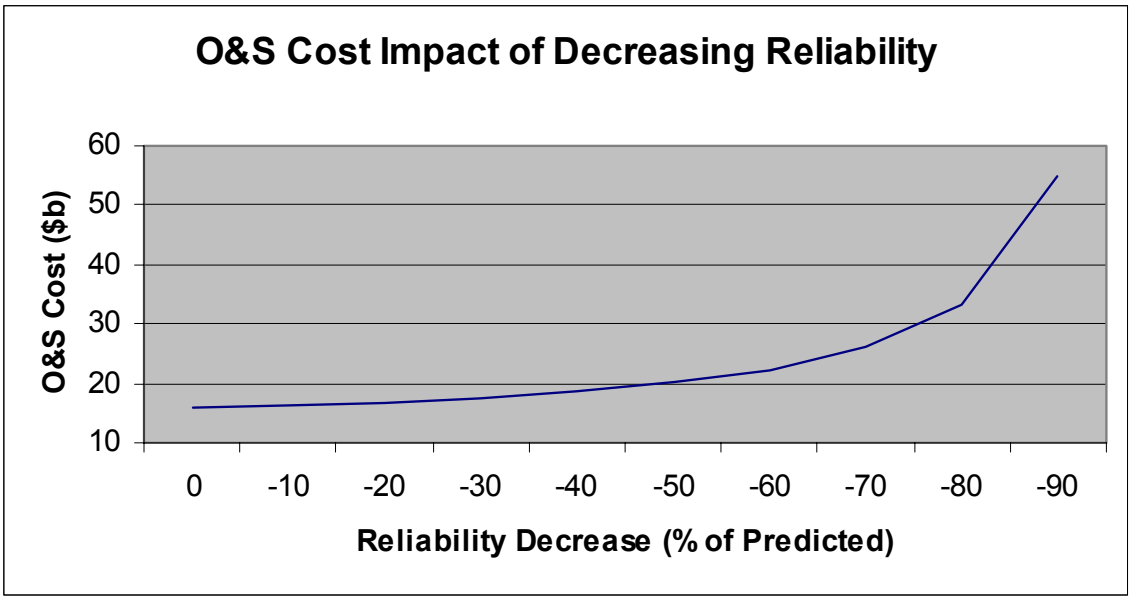
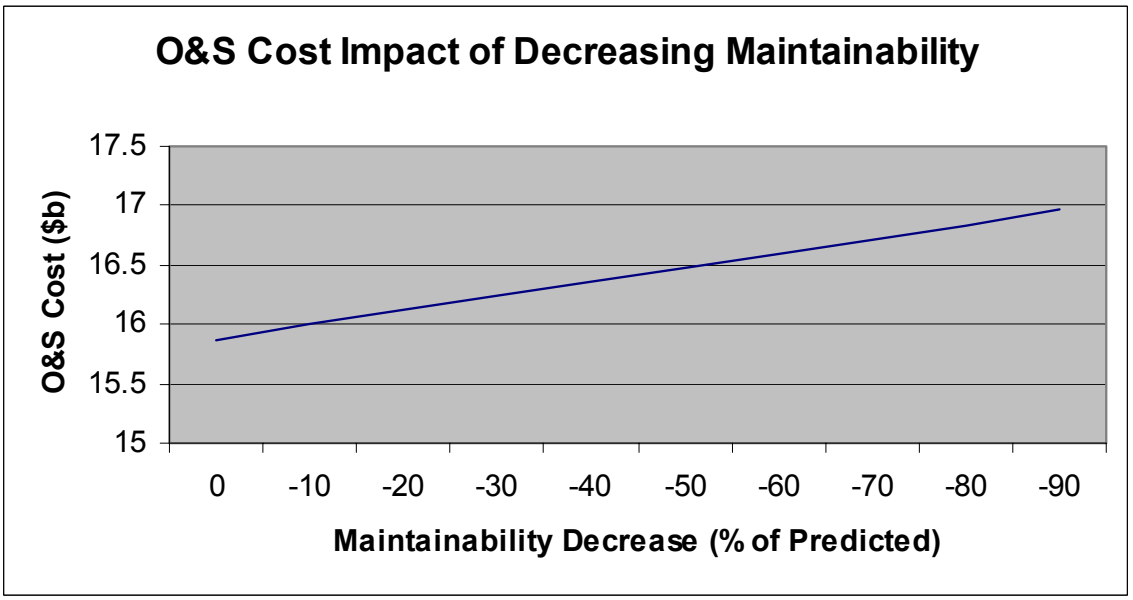
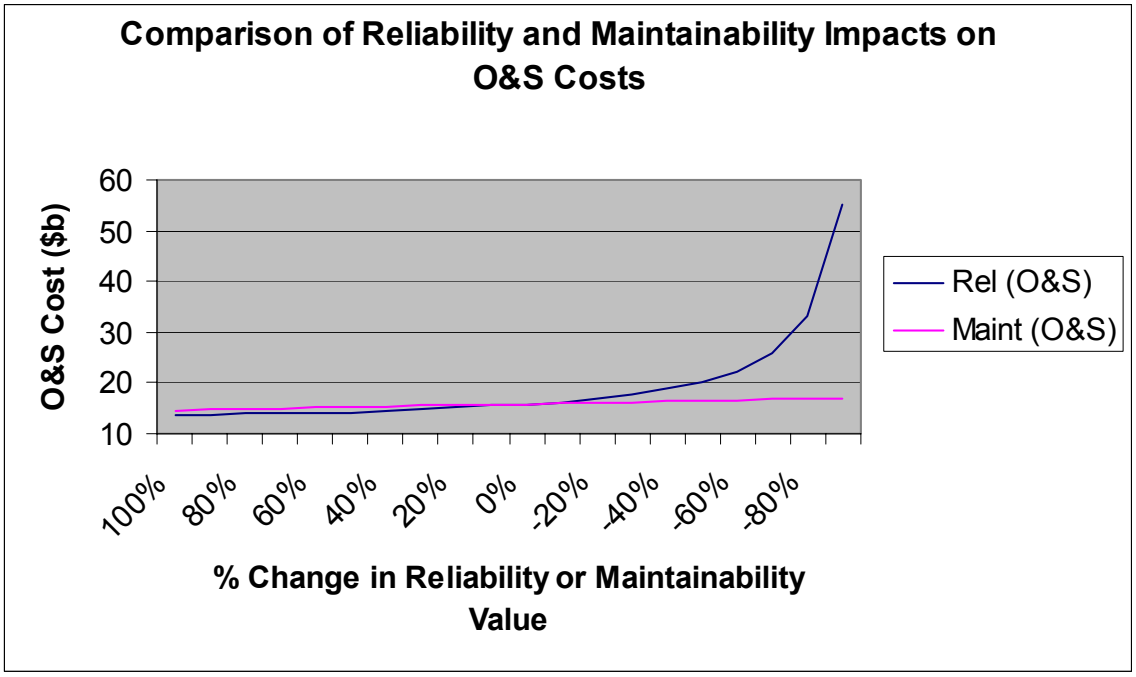
APPENDIX E: RELIABILITY AND MAINTAINABILITY ANALYSIS



Sensitivity of O&S Costs to Decreasing Reliability below Predicted Values

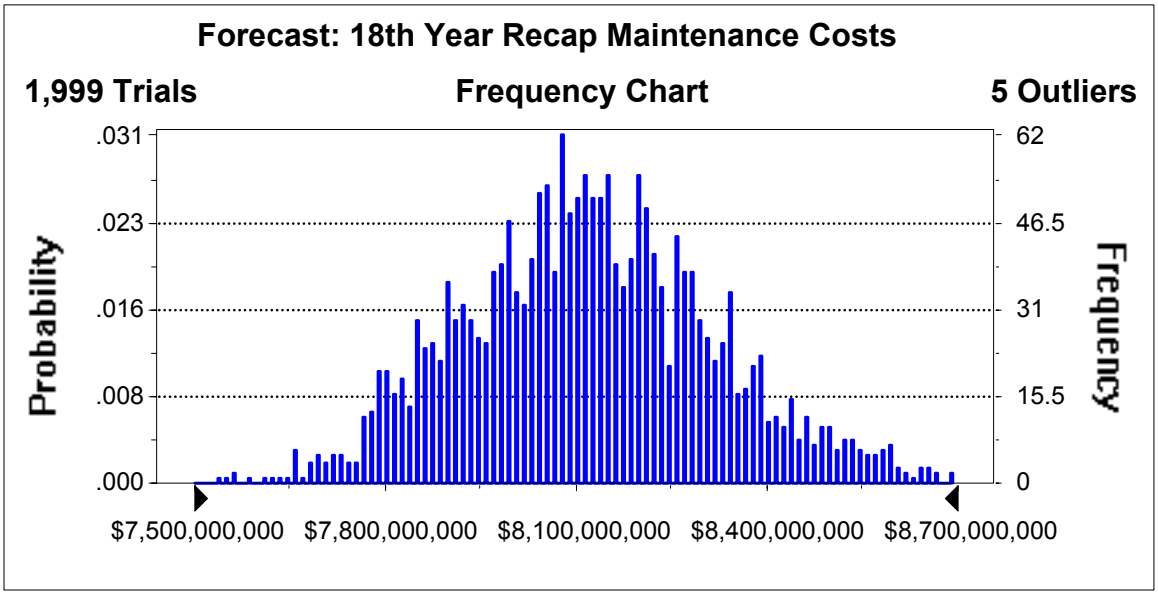


Sensitivity of O&S Costs to Decreasing Maintainability below Predicted Values

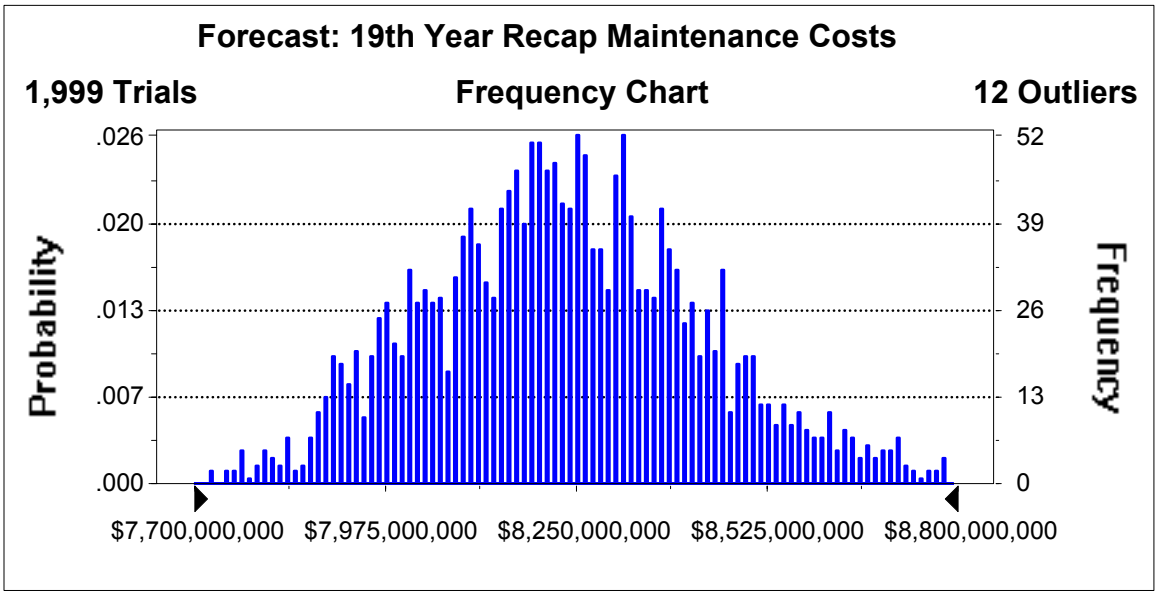


Comparison of O&S Cost Sensitivity to Varying Levels of Reliability and Maintainability

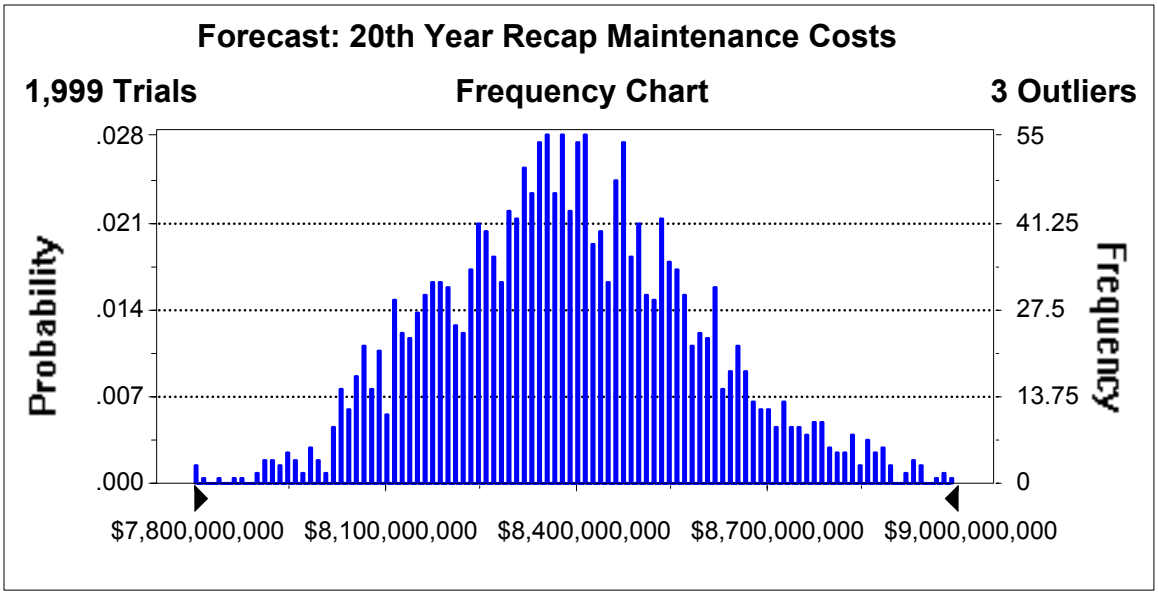
APPENDIX F: AIRCRAFT RECAPITALIZATION RESULTS



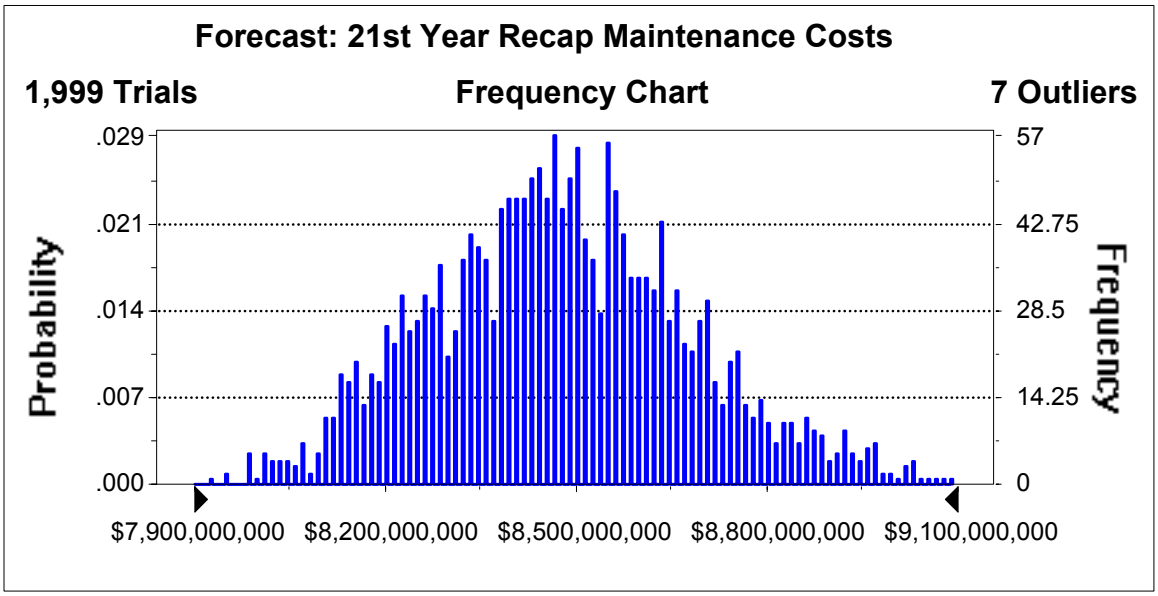
Simulation Results of Maintenance Costs for Recapitalization Occurring in the 18th Year of Aircraft Service (Mean: $8,122,668,233)



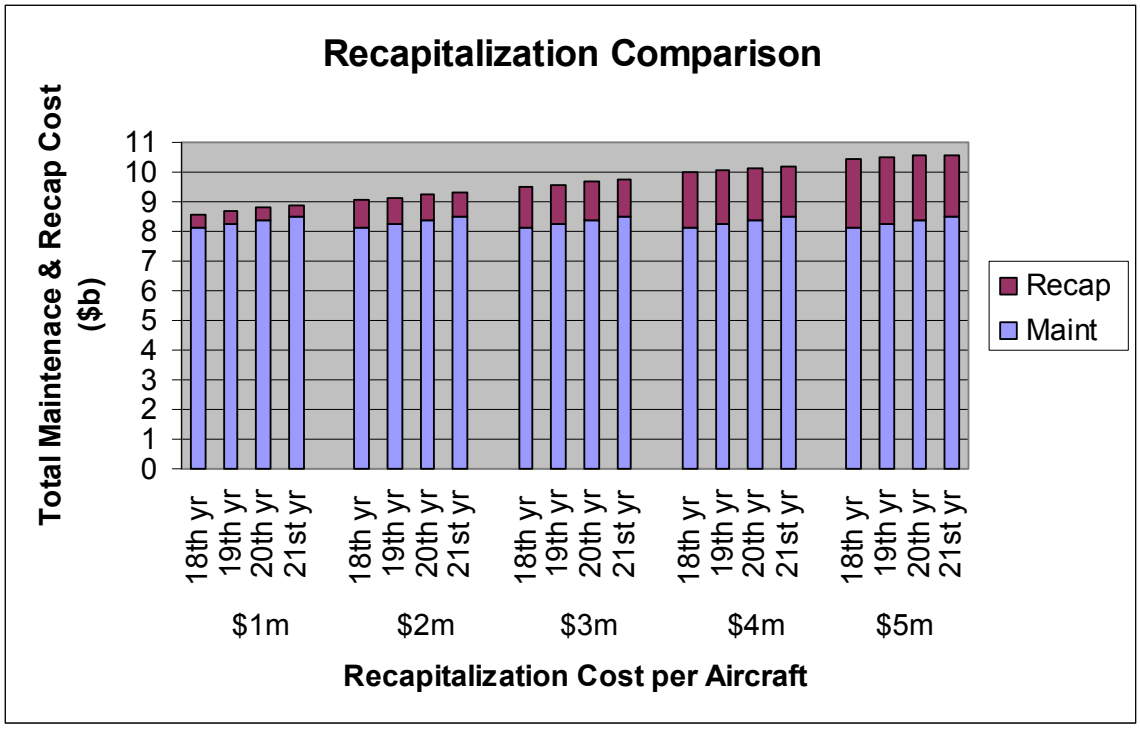
Simulation Results of Maintenance Costs for Recapitalization Occurring in the 19th Year of Aircraft Service (Mean: $8,234,365,445)



Simulation Results of Maintenance Costs for Recapitalization Occurring in the 20th Year of Aircraft Service (Mean: $8,390,372,919)



Simulation Results of Maintenance Costs for Recapitalization Occurring in the 21st Year of Aircraft Service (Mean: $8,477,682,538)



Comparison of Maintenance and Recapitalization Costs for the 18th through 21st Years

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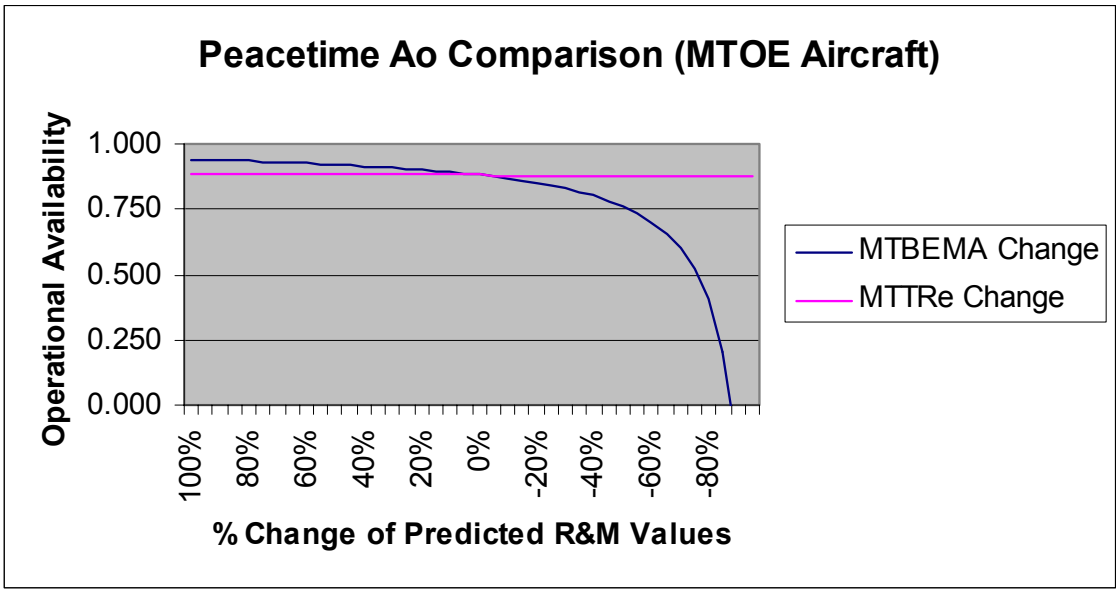
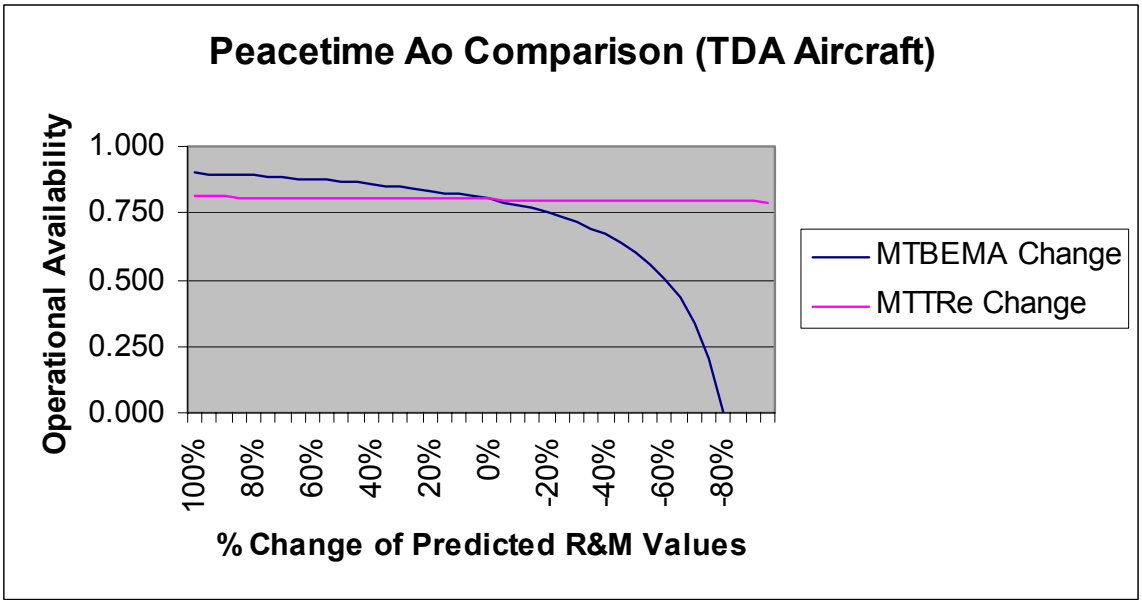
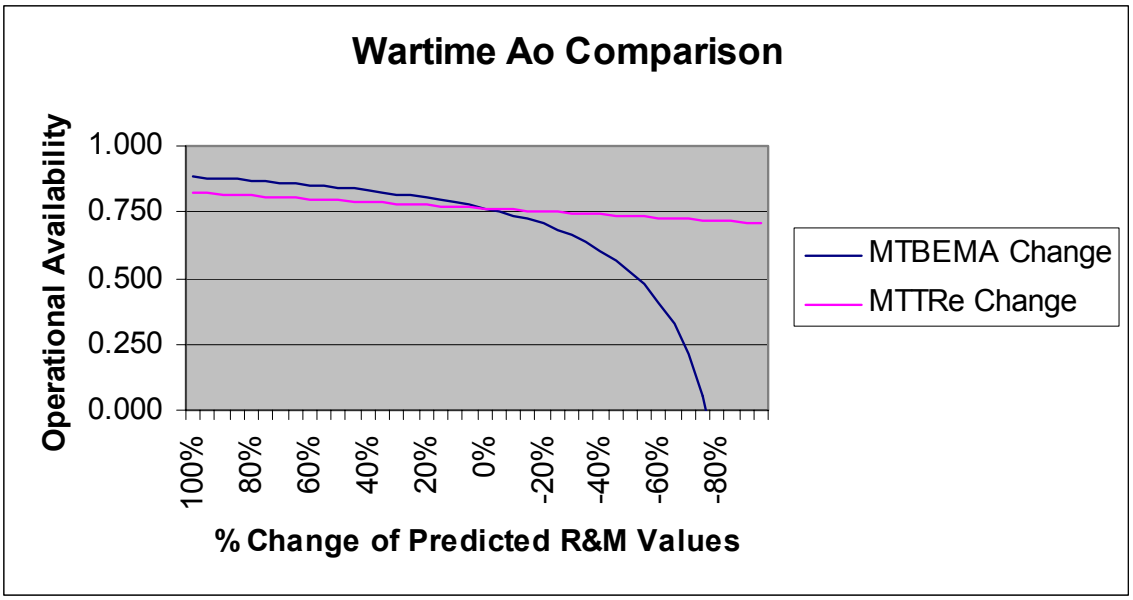
APPENDIX G: OPERATIONAL AVAILABILITY RESULTS



Sensitivity of Peacetime MTOE Aircraft Operational Availability to Variations in Reliability and Maintainability Values



Sensitivity of Peacetime TDA Aircraft Operational Availability to Variations in Reliability and Maintainability Values



Sensitivity of Wartime MTOE Aircraft Operational Availability to Variations in Reliability and Maintainability

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   Naval Postgraduate School
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7. Major General Joseph L. Bergantz
   Program Executive Officer, Aviation
   Redstone Arsenal, AL

8. COL Robert P. Birmingham
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9. CPT Gregg M. Dellert
   Franklin, TN